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## EFFECTS OF UNDERLOADS ON FATIGUE CRACK GROWTH; DATA TABULATIONS

LOCKHEED-GEORGIA COMPANY  
MARIETTA, GEORGIA 30063

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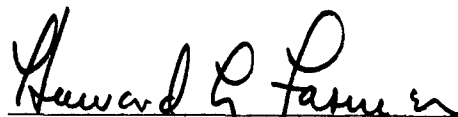
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The effects of single overload-underload interaction on constant amplitude crack growth in 2219-T851 aluminum alloy are characterized in terms of delay cycles, affected zone sizes and overload shut-off ratios. Data are presented showing the effects of overload-underload/underload-overload sequences, overload magnitude, underload magnitude, and the constant amplitude maximum and minimum. The effects of hold periods in both tension and compression are also experimentally investigated. Delay cycle data are correlated with predictions from three different crack growth retardation models; namely		

20. ABSTRACT (Cont'd)

the generalized Wheeler model, the generalized Willenborg model and the Grumman closure model. For each model, predictions are made using an assumed plastic zone radius and diameter for both plane stress and plane strain conditions and model comparisons are made. Correlations of measured affected zone sizes with the four different assumed plastic zone sizes are also presented. Sensitivities of the generalized Wheeler and generalized Willenborg models to overload shut-off ratio and threshold stress intensity factor are determined. Prediction sensitivity to three different crack growth equations for the 2219-T851 aluminum alloy is also evaluated. Recommendations for future work in development of crack growth retardation models are presented.



## FOREWORD

Reported herein are results of work performed by the Lockheed-Georgia Company on Contract No. F33615-75-C-3111, "Underload Effects on Spectrum Crack Growth". The effort was sponsored by the Air Force Flight Dynamics Laboratory as part of the "Advanced Metallic Structures - Advanced Development Program" (AMS-ADP), Project No. 486U. Mr. Robert Engle of AFFDL/FBE was the Air Force Project Engineer.

The Lockheed Project Engineer was W. M. McGee of the Structures and Materials Laboratory. Analytical work was performed by Dr. T. M. Hsu. The experimental evaluations were accomplished by F. L. Amend who was assisted by R. I. Prescott and L. T. Reynolds. This is Volume II of the final technical report and contains tabulations of basic data generated during the experimental evaluations performed over the period of July 1975 - October 1976.

## CONTENTS

SECTION		PAGE
I	INTRODUCTION	1
II	EXPERIMENTAL PROGRAM	3
	General	3
	Load Classifications and Stress Intensity Factor Parameters	3
	Material and Specimens	3
	Testing Procedures	3
	Data Tabulations	4
	Data Summary and Limitations	5

# LIST OF FIGURES

<u>FIGURE</u>		<u>PAGE</u>
1	Summary of Load Classifications	7
2	Stress Intensity Factor Parameters	8
3	Basic Program - $K_2=10 \text{ KSI} \sqrt{\text{In.}}$	9
4	Program For $K_2=7.78 \text{ KSI} \sqrt{\text{In.}}$	10
5	Program for $K_2=14 \text{ KSI} \sqrt{\text{In.}}$	11
6	Program for Hold Time Evaluations	12
7	Test Specimen Configuration	13
8	Retardation Parameters	14
9	Typical Incremental Data	15
10	Average Data for Three Runs in Figure 9 Referenced to Midpoints of Measurement Increments	17
11	Average Data for Three Runs in Figure 9 Referenced to Points of Measurement	18
12	Retardation Parameter Data for Tension-Tension Load Class, $K_2=10 \text{ KSI} \sqrt{\text{In.}}$	19
13	Retardation Parameter Data for Tension-Tension Load Class, $K_2=14$ and $7.78 \text{ KSI} \sqrt{\text{In.}}$	20
14	Retardation Parameter Data for Tension-Zero Load Class, $K_2=10 \text{ KSI} \sqrt{\text{In.}}$	21
15	Retardation Parameter Data for Tension-Zero Load Class, $K_2=14$ and $7.78 \text{ KSI} \sqrt{\text{In.}}$	22
16	Retardation Parameter Data for Zero-Tension Load Class, $K_2=10 \text{ KSI} \sqrt{\text{In.}}$	23
17	Retardation Parameter Data for Compression-Tension Load Class, $K_2=10 \text{ KSI} \sqrt{\text{In.}}$	24
18	Retardation Parameter Data for Compression-Tension Load Class, $K_2=14$ and $7.78 \text{ KSI} \sqrt{\text{In.}}$	25
19	Retardation Parameter Data for Tension-Compression Load Class, $K_2=10 \text{ KSI} \sqrt{\text{In.}}$	26
20	Retardation Parameter Data for Tension-Compression Load Class, $K_2=14$ and $7.78 \text{ KSI} \sqrt{\text{In.}}$	27
21	Retardation Parameter Data for Tension-Compression Load Class, $K_2=10$ and $K_5 = -7.5 \text{ KSI} \sqrt{\text{In.}}$	28
22	Retardation Parameter Data for Hold Times in Tension	29
23	Retardation Parameter Data for Hold Times in Compression	30

# LIST OF TABLES

TABLES		PAGES
1-29	Data Tabulations for Tension-Tension Load Class, $K_2=10 \text{ KSI } \sqrt{\text{In.}}$	31-94
30-41	Data Tabulations for Tension-Tension Load Class, $K_2=7.78 \text{ and } 14 \text{ KSI } \sqrt{\text{In.}}$	95-118
42-63	Data Tabulations for Tension-Zero Load Class, $K_2=10 \text{ KSI } \sqrt{\text{In.}}$	119-159
64-78	Data Tabulations for Tension-Zero Load Class, $K_2=7.78 \text{ and } 14 \text{ KSI } \sqrt{\text{In.}}$	160-188
79-87	Data Tabulations for Zero-Tension Load Class, $K_2=10 \text{ KSI } \sqrt{\text{In.}}$	189-212
88-102	Data Tabulations for Compression-Tension Load Class, $K_2=10 \text{ KSI } \sqrt{\text{In.}}$	213-239
103-113	Data Tabulations for Compression-Tension Load Class, $K_2=7.78 \text{ and } 14 \text{ KSI } \sqrt{\text{In.}}$	240-261
114-151	Data Tabulations for Tension-Compression Load Class, $K_2=10 \text{ KSI } \sqrt{\text{In.}}$	262-360
152-178	Data Tabulations for Tension-Compression Load Class, $K_2=7.78 \text{ and } 14 \text{ KSI } \sqrt{\text{In.}}$	361-431
179-195	Data Tabulations for Tension-Compression Load Class, $K_2=10 \text{ and } K_5 = -7.5 \text{ KSI } \sqrt{\text{In.}}$	432-474
196-220	Data Tabulations for Tension-Tension Load Class With Hold Time in Tension	475-533
221-237	Data Tabulations for Tension-Compression Load Class With Hold Time in Compression	534-575

## SUMMARY

An experimental and analytical investigation was performed under Contract No. F33615-75-C-3111 to characterize the effects of underloads on crack growth and to evaluate current crack growth retardation models for predicting underload effects. This is Volume II of the final technical report and contains tabulations of basic data collected during the experimental portion of the program. Data tabulations are presented for approximately 200 different variables evaluated on specimens from a single heat of 2219-T851 aluminum alloy plate. The 200 variables represented combinations of different load classes and stress intensity factor parameters. Load classes evaluated were tension-tension, tension-zero, zero-tension, tension-compression and compression-tension. Stress intensity factor parameters varied for each load class were the overload stress intensity factor ratio, constant amplitude stress intensity factor ratio and the underload stress intensity factor ratio. The maximum of the constant amplitude stress intensity factor was also a variable. Data tabulations are also presented for limited evaluations on hold times in tension and compression.

Volume I contains analytical predictions and data correlations for the same variables evaluated experimentally. Predictions were made using three current crack growth retardation models in generalized form; namely the Wheeler model, Willenborg model and closure model. The models were evaluated to determine prediction sensitivity for variances in overload shut-off ratio, stress intensity factor threshold and overload affected zone size formulations. Also evaluated, was prediction sensitivity associated with different crack growth rate equations for the 2219-T851 aluminum alloy.

## SECTION I INTRODUCTION

Analytical methodology to predict subcritical crack growth in aerospace structures subjected to complex loading is an essential element in the overall fracture control program currently being applied on fracture critical structures. Current analytical methods for complex loading are not precise; however, considerable effort has, and is, being directed toward a better understanding of the crack growth process. From such efforts will evolve improved analytical modeling of fatigue crack behavior. Within the current state of technology, an unconservative or conservative crack growth prediction is possible depending upon the analysis methodology selected for a particular load profile. Consequently, current methods must be judiciously applied and substantiated by adequate testing. Eventually, unconservatism must be eliminated for reasons of safety and structural life, and over-conservatism must be eliminated since it integrates throughout the entire design process to adversely effect total performance.

It is generally agreed that linear analysis produces acceptable crack growth predictions for constant amplitude loading provided an adequate data base is available, a valid stress intensity factor solution is available, and environmental variations are excluded. The introduction of a high load, however, retards subsequent crack growth to the extent that use of linear analysis without considering load interaction effects is precluded. Considerable data are available characterizing this retardation effect, and several retardation models have been developed for predicting the overload effects on subsequent crack growth rate. Limited data are available which show that this retardation effect is reduced when the high load is followed by a compressive load or underload. The current retardation models account for the beneficial effects produced by overload conditions, but most models do not consider a reduction in these beneficial effects when underloads are included. Further characterization of the underload effect and its interaction with overloads was necessary to identify controlling parameters which will guide future development of analytical methods to more accurately predict crack growth under complex loading.

This program represents an experimental and analytical investigation to characterize crack growth behavior associated with underloads and their interaction with overloads. The experimental effort encompassed approximately 200 variables which represented combinations of load profile classes and stress intensity

factor parameters. All experimental evaluations were performed on specimens from a single heat of 2219-T851 aluminum alloy plate. Analytical predictions were made for the same variables evaluated experimentally. Predictions were made using three current retardation models in generalized form, and these predictions were correlated with the experimental data. Sensitivities of the models to such parameters as overload shut-off ratio, stress intensity factor threshold and overload affected zone size formulations were evaluated.

## SECTION II EXPERIMENTAL PROGRAM

General - Volume I contains complete details of the experimental evaluations; however, essential elements are briefly covered in the following sections to provide a general understanding of the program and data tabulations. For complete details, Volume I must also be consulted.

### Load Classifications and Stress Intensity Factor Parameters

Seven different load classes were evaluated as illustrated in Figure 1. Note that three different sequences were contained in the tension-tension class. These were illustrated in terms of stress intensity factor,  $K$ , since testing was performed under quasi-constant  $K$  conditions as later described. Definitions of the stress intensity factor parameters evaluated are contained in Figure 2. The basic program for  $K_2$  constant at  $10 \text{ KSI} \sqrt{\text{In.}}$  is shown in Figure 3 and represents combinations of load classes and stress intensity factor parameters. Parameters evaluated for  $K_2 = 7.78 \text{ KSI} \sqrt{\text{In.}}$  and  $14 \text{ KSI} \sqrt{\text{In.}}$  are shown in Figures 4 and 5, respectively. Conditions evaluated to determine hold time effects are defined in Figure 6.

Material and Specimens - All experimental evaluations were performed on specimens machined from 2219-T851 aluminum alloy plates having a nominal thickness of 5/8-inch. All test specimens were the center crack configuration shown in Figure 7. The test section of each specimen was polished to enhance crack tip detection, and one surface was prepared with a grill against which to reference subsequent crack length measurements. Pitch of the grill was approximately 0.010 inch, and exact value was determined for each specimen using a toolmaker's microscope.

Testing Procedures - All testing was performed in ambient temperature desiccated air. Where compressive loading was required, Teflon lined lateral support bars were employed to prevent specimen buckling. Two identical electro-hydraulic servo controlled test systems manufactured by MTS Systems Corporation were employed. The test systems were programmed and controlled by digital computers. Load form was sinusoidal at a frequency of 12 cycles per second for the constant amplitude cycles; however, a much slower rate was used for the overload and underload cycles.

Each test system computer was programmed to accept desired stress intensity values as input, compute corresponding loads using the stress intensity factor equation



for a finite width center cracked plate, and then apply these loads to the specimen. Periodically during test, crack length measurements were made by microscopically observing the crack tip against the grill. The computer was supplied these measurements, and loads were automatically reduced in accordance with the stress intensity factor equation. In this manner testing was accomplished under quasi-constant  $K$  conditions, and crack length data were updated at intervals necessary to maintain desired  $K$  values within one percent.

In evaluating each of the previously defined variables, constant amplitude cycling was initially performed using the appropriate  $R$  and  $K_2$  values. This was continued while collecting data until it was assured that a constant growth rate had been reached. The desired overload-underload cycle was then applied followed by the previously applied constant amplitude condition. During this constant amplitude cycling, crack length and cycle data were periodically recorded until it was assured that the previous constant amplitude growth rate had been reached. From these data, the number of delay cycles,  $N_D$ , produced by the overload-underload cycle and the associated affected zone size,  $a^*$ , were determined. These retardation parameters are defined in Figure 8. Except for cases producing a large number of delay cycles and hold time evaluations, at least three data runs were usually made. For those data runs, crack length measurements were made at the same cycle increments, established based on a preliminary run, which allowed data averaging.

In performing the experimental evaluations, the overload ratio,  $S$ , was increased by 0.5 increments until shut-off was reached. Additional tests were then performed at intermediate values of  $S$  to zero-in on the overload shut-off ratio to within 0.1. In determining overload shut-off ratio, cycling was performed until it was assured that crack growth rate was less than  $10^{-9}$  inch per cycle which corresponds to threshold growth rate from basic  $da/dN$  data.

Data Tabulations - In addition to controlling the tests, the computers were also used to store, reduce and output tabular data. Data tabulations in this report are copies of the computer output. Each data tabulation is comprised of three parts; incremental data for each run, average crack length referenced to the midpoint of the cycle increment and average crack length referenced to the cycle increment at time of measurement. Typical data representative of these three parts are shown in Figures 9, 10 and 11, respectively. Notes of explana-

tion are also included in these figures. Where more than one run was made, the tabulated incremental data represent all measurement increments. In most cases more incremental data than tabulated were collected for cases where only one run was made. More incremental data were collected for those cases to insure that the desired quasi-constant K conditions were maintained; however, the computer program allowed combining data increments to prevent extremely long data tabulations. As the overload shut off ratio was approached, both crack tips did not always recover at the same rate which produced an eccentric crack. When this occurred, testing was terminated before the difference in far field correction factors for the symmetric crack and eccentric crack invalidated quasi-constant K conditions. The resulting data were subsequently reduced to reflect growth of only one crack tip. Where this was done, it was noted on the data tabulation.

The data tabulations are organized by load class as follows:

LOAD CLASS	TABLES
Tension-Tension, $K_2=10$	1-29
Tension-Tension, $K_2=7.78$ and $K_2=14$	30-41
Tension-Zero, $K_2=10$	42-63
Tension-Zero, $K_2=7.78$ and $K_2=14$	64-78
Zero-Tension, $K_2=10$	79-87
Compression-Tension, $K_2=10$	88-102
Compression-Tension, $K_2=7.78$ and $K_2=14$	103-113
Tension-Compression, $K_2=10$	114-151
Tension-Compression, $K_2=7.78$ and $K_2=14$	152-178
Tension-Compression, $K_2=10$ and $K_5=-7.5$	179-195
Tension-Tension, Hold Time	196-220
Tension-Compression, Hold Time	221-237

Within the tabulations for each load class, data are organized with respect to increasing overload ratio, S. All values of K are in  $\text{KSI}\sqrt{\text{In.}}$ .

Data Summary and Limitations - Where delay rather than shut-off was obtained, the data tabulations were used to determine the number of delay cycles,  $N_D$ , and overload affected zone size,  $a^*$ . Average data referenced to the midpoints of measurement increments, illustrated in Figure 10, were used in these determinations.

For the data shown in Figure 10, the crack was considered to have reached constant rate at increment 14. This increment corresponds to 56,000 delay cycles and an affected zone size of 0.0144 inch. Data obtained in this manner are contained in Figures 12 through 23 for the various load classes and stress intensity factor parameters evaluated.

Based on fractographic evaluations, stable tear occurred during the overload cycle for cases where  $K_I$  exceeded  $30 \text{ KSI} \sqrt{\text{In.}}$ . Data for those cases contain the stable tear crack extension which should be considered in their use. This data limitation applies only to tension-compression evaluations in Figures 19 and 20.

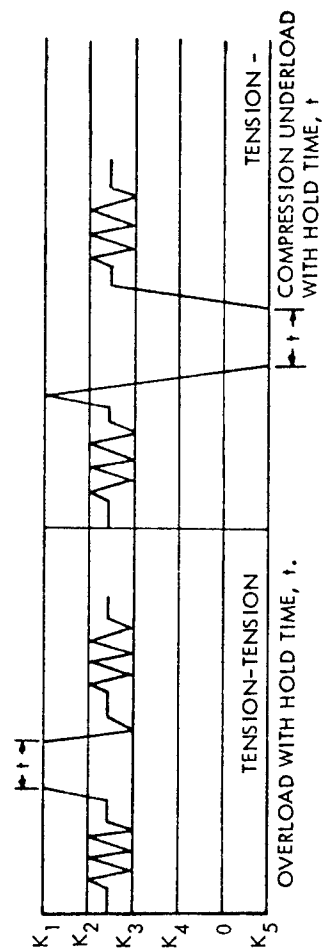
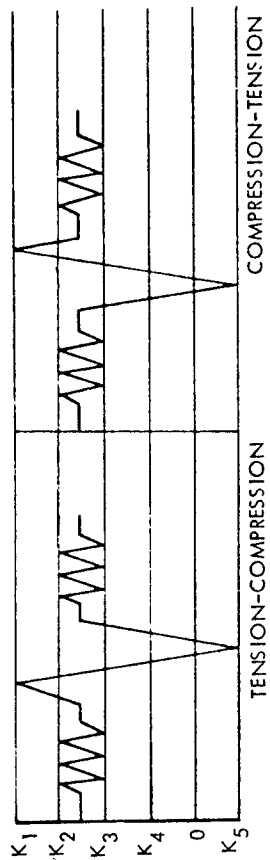
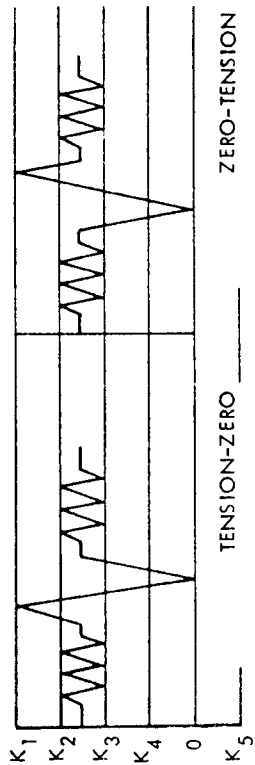
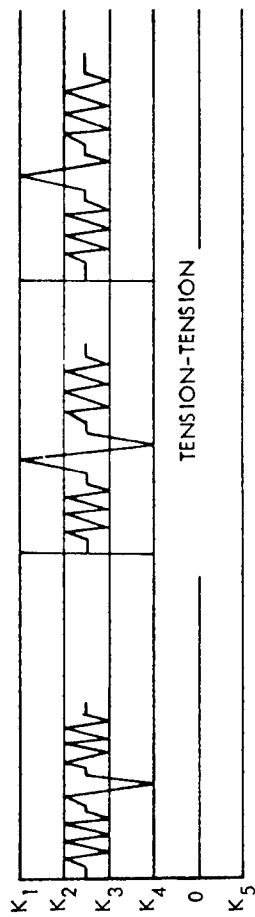
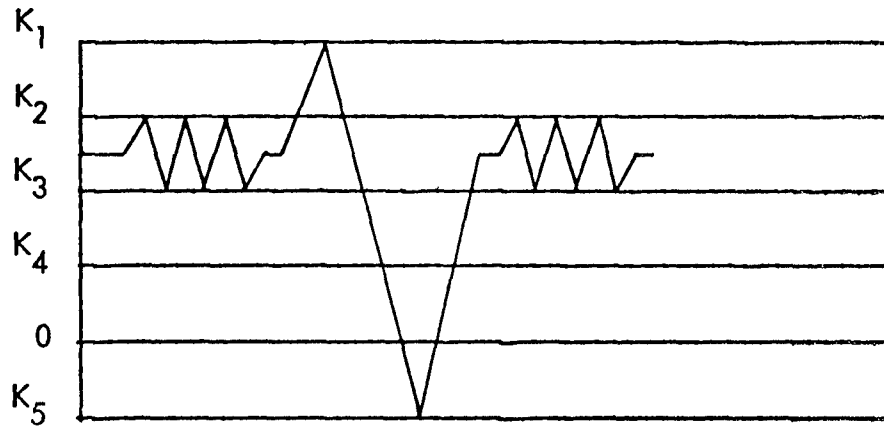


FIGURE 1. SUMMARY OF LOAD CLASSIFICATIONS



PARAMETER

OVERLOAD STRESS INTENSITY RATIO,  $S = \frac{K_1}{K_2}$

CONSTANT AMPLITUDE STRESS INTENSITY RATIO,  $R = \frac{K_3}{K_2}$

UNDERLOAD STRESS INTENSITY RATIO,  $U = \frac{K_1}{K_4}$

COMPRESSIVE STRESS INTENSITY RATIO,  $U_c = \frac{K_1}{K_5}$

FIGURE 2. SUMMARY OF STRESS INTENSITY FACTOR PARAMETERS

OVERLOAD STRESS INTENSITY RATIO, $S = \frac{K_1}{K_2}$	CONSTANT AMPLITUDE STRESS INTENSITY RATIO, $R = K_3/K_2$		LOAD CLASSIFICATION				
	R	$\Delta K = K_2 - K_3$ (KSI $\sqrt{\text{IN.}}$ )	TENSION-TENSION $U = \frac{K_1}{K_4}$	TENSION-ZERO $U^{-1} = \frac{K_4}{K_1}$	ZERO-TENSION $U^{-1} = \frac{K_4}{K_1}$	TENSION-COMPRESSION $U_c = \frac{K_1}{K_5}$	COMPRESSION-TENSION $U_c = \frac{K_1}{K_5}$
1.0	0.1 0.3 0.5	9 7 5	6.67 4.0	0 0		-0.67 -0.67	
1.5	0.1 0.3 0.5	9 7 5	15.0 10.0, 5.0 6.0, 3.0	0 0 0	0 0	-2.0, -1.0 -2.0, -1.0 -2.0, -1.0	-1.0 -1.0 -1.0
2.0	0.1 0.3 0.5	9 7 5	20.0 13.33, 6.67 8.0, 4.0	0 0 0	0 0	-2.67, -2.0, -1.0 -2.67, -2.0, -1.0 -2.67, -2.0, -1.0	-1.0 -1.0 -1.0
2.4	0.5	5	4.8				
2.5	0.1 0.3 0.5	9 7 5	25.0 16.67, 8.33 10.0	0 0 0	0 0 0	-3.35, -2.0, -1.0 -3.33, -2.0, -1.0 -3.33, -2.0, -1.0	-1.0 -1.0 -1.0
2.6	0.5	5					
2.7	0.5	5	10.8				-1.0
2.8	0.3	7					
2.9	0.3 0.5	7 5	9.67	0			
3.0	0.1 0.3 0.5	9 7 5	30.0 20.0	0 0 0	0	-4, -2.0, -1.0 -4, -2.0, -1.0 -4, -2.0, -1.0	-1.0
3.1	0.3	7	20.67				
3.2	0.1	9	32.0	0			
3.5	0.1 0.3 0.5	9 7 5				-2.0, -1.0 -2.0, -1.0 -4.67, -2.0, -1.0	
3.6	0.3	7				-4.8	
3.7	0.1	9				-4.93	
4.0	0.1 0.3 0.5	9 7 5				-2.0, -1.0 -2.0, -1.0 -2.0, -1.0	

FIGURE 3. BASIC PROGRAM,  $K_2=10$  KSI  $\sqrt{\text{IN.}}$

OVERLOAD STRESS INTENSITY RATIO, $S = \frac{K_1}{K_2}$	CONSTANT AMPLITUDE STRESS INTENSITY RATIO, $R = K_3/K_2$		LOAD CLASSIFICATION			
	R	$\Delta K = K_2 - K_3$ (KSI $\sqrt{\text{IN.}}$ )	TENSION-TENSION $U = \frac{K_1}{K_4}$	TENSION-ZERO $U^{-1} = \frac{K_4}{K_1}$	TENSION-COMPRESSION $U_c = \frac{K_1}{K_5}$	COMPRESSION-TENSION $U_c = \frac{K_1}{K_5}$
1.5	0.1	7	15.0	0	-2.0,-1.0	-1.0
2.0	0.1	7	20.0	0	-2.0,-1.0	-1.0
2.5	0.1	7	25.0	0	-2.0,-1.0	-1.0
3.0	0.1	7	30.0	0	-2.0,-1.0	-1.0
3.1	0.1	7				-1.0
3.4	0.1	7		0		
3.5	0.1	7			-2.0,-1.0	
4.0	0.1	7			-2.0,-1.0	
4.1	0.1	7			-2.0	
4.5	0.1	7			-1.0	
5.0	0.1	7			-1.0	

FIGURE 4 PROGRAM FOR  $K_2 = 7.78 \text{ KSI } \sqrt{\text{IN.}}$

OVERLOAD STRESS INTENSITY RATIO, $S = \frac{K_1}{K_2}$	CONSTANT AMPLITUDE STRESS INTENSITY RATIO, $R = K_3/K_2$		LOAD CLASSIFICATION			
	R	$\Delta K = K_2 - K_3$ (KSI $\sqrt{\text{IN.}}$ )	TENSION-TENSION $U = \frac{K_1}{K_4}$	TENSION-ZERO $U^{-1} = \frac{K_4}{K_1}$	TENSION-COMPRESSION $U_c = \frac{K_1}{K_5}$	COMPRESSION-TENSION $U_c = \frac{K_1}{K_5}$
1.5	0.5	7	3.0	0	-2.0, -1.0	-1.0
2.0	0.5	7	4.0	0	-2.0, -1.0	-1.0
2.3	0.5	7	4.6			
2.5	0.5	7		0	-2.0, -1.0	
3.0	0.5	7		0	-2.0, -1.0	
3.5	0.5	7			-2.0, -1.0	
4.0	0.5	7			-1.0	

FIGURE 5 PROGRAM FOR  $K_2 = 14 \text{ KSI } \sqrt{\text{IN.}}$



OVERLOAD STRESS INTENSITY RATIO	CONSTANT AMPLITUDE STRESS INTENSITY RATIO, $R=K_3/K_2$	LOAD CLASSIFICATION									
		TENSION-TENSION WITH HOLD AT $K_1$ $U = K_1/K_4$ AT TIME					TENSION-COMPRESSION WITH HOLD AT $K_5$ $U_c = K_1/K_5$ AT TIME				
		0	5 Sec.	0.25 Hr.	1.0 Hr.	4.0 Hr.	24.0 Hr.	0	0.25 Hr.	1.0 Hr.	24.0 Hr.
$S = K_1/K_2$	$R$ $K_2',$ KSI $\sqrt{\text{In.}}$	0	5 Sec.	0.25 Hr.	1.0 Hr.	4.0 Hr.	24.0 Hr.	0	0.25 Hr.	1.0 Hr.	24.0 Hr.
2.0	0.1	20	20	20	20	20	20	-0.8	-0.8	-0.8	-0.8
2.57	0.13	20	20	20	20	20	20	-0.8	-0.8	-0.8	-0.8
2.0	0.5	4,20	4,20	4,20	4,20	4,20	4,20	-1,-2	-1,-2	-1,-2	-1,-2
2.5	0.1	25	25	25	25	25	25	-1	-1	-1	-1
2.5	0.5	25	25	25	25	25	25	-1	-1	-1	-1
3.21	0.13	7.78	7.78	7.78	7.78	7.78	7.78	-1	-1	-1	-1

FIGURE 6. PROGRAM FOR HOLD TIME EVALUATIONS

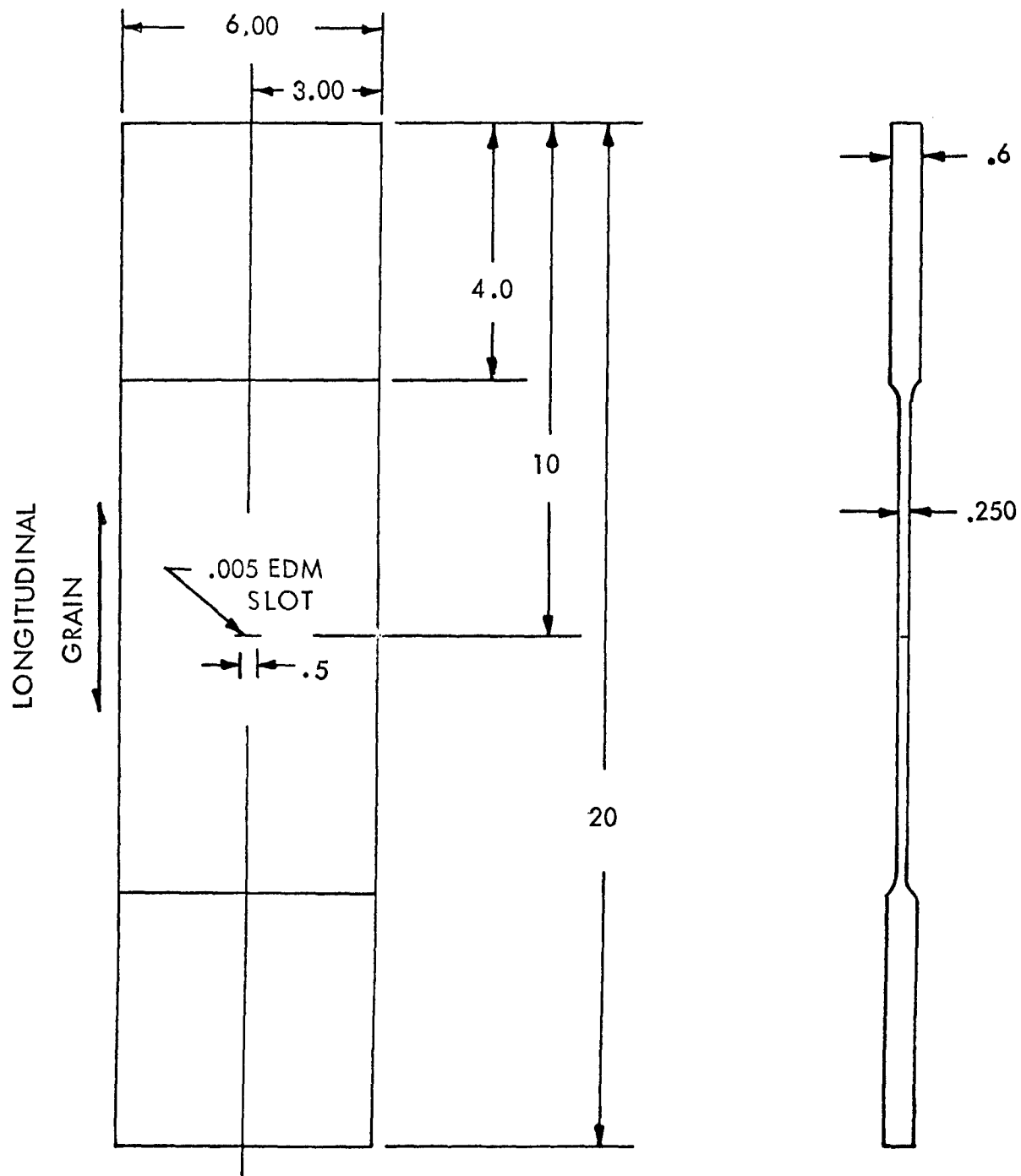


FIGURE 7  
Test Specimen Configuration

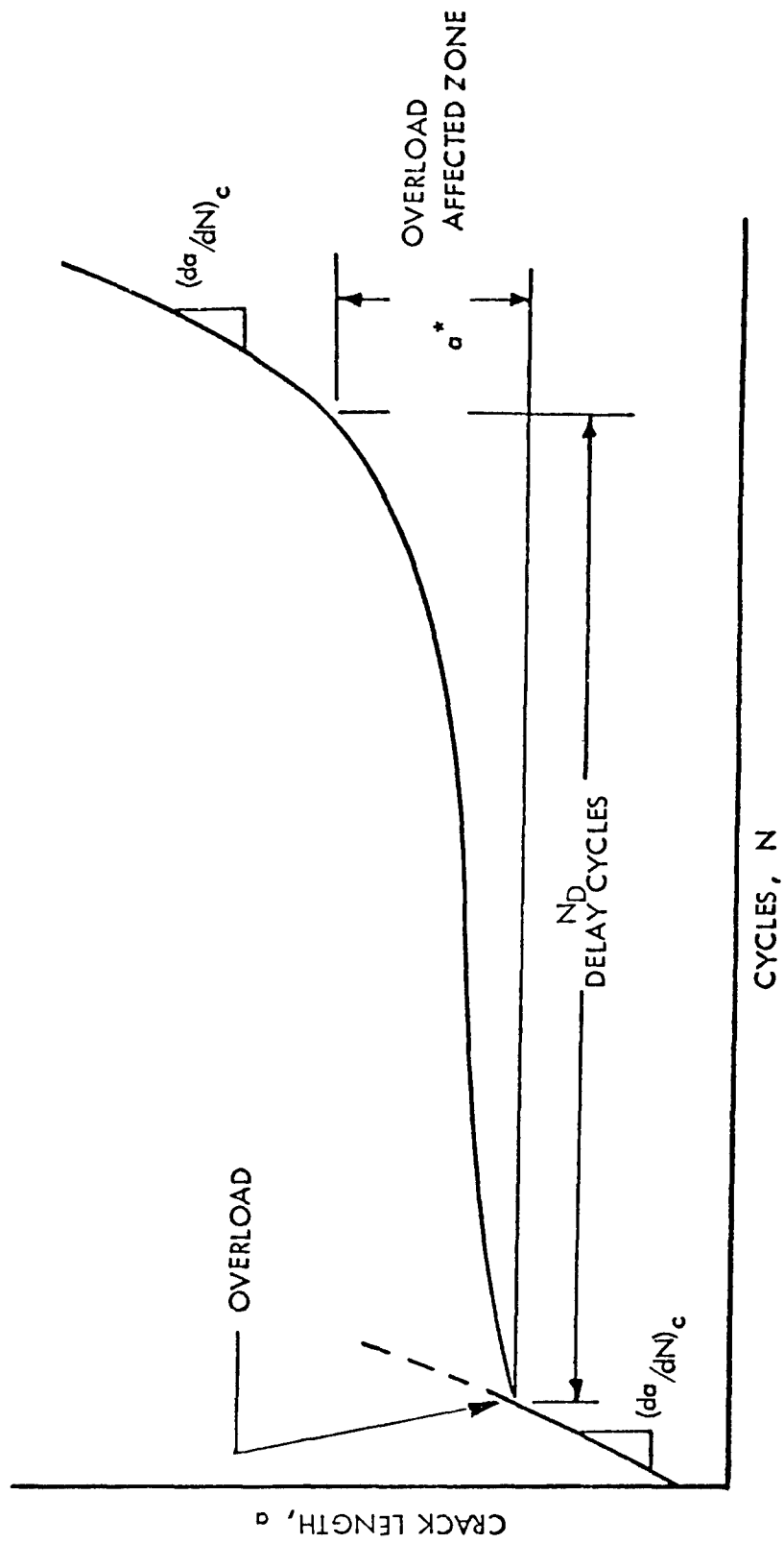


FIGURE 8 - RETARDATION PARAMETERS

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 5-L-17, (COMPRESSION-TENSION)  
 $F=12\text{Hz}$ ,  $K2=10$ ,  $R=0.5$ ,  $U_c = -1$ ,  $S=2.0$

LOAD CLASS  
 SEE FIGURE 1

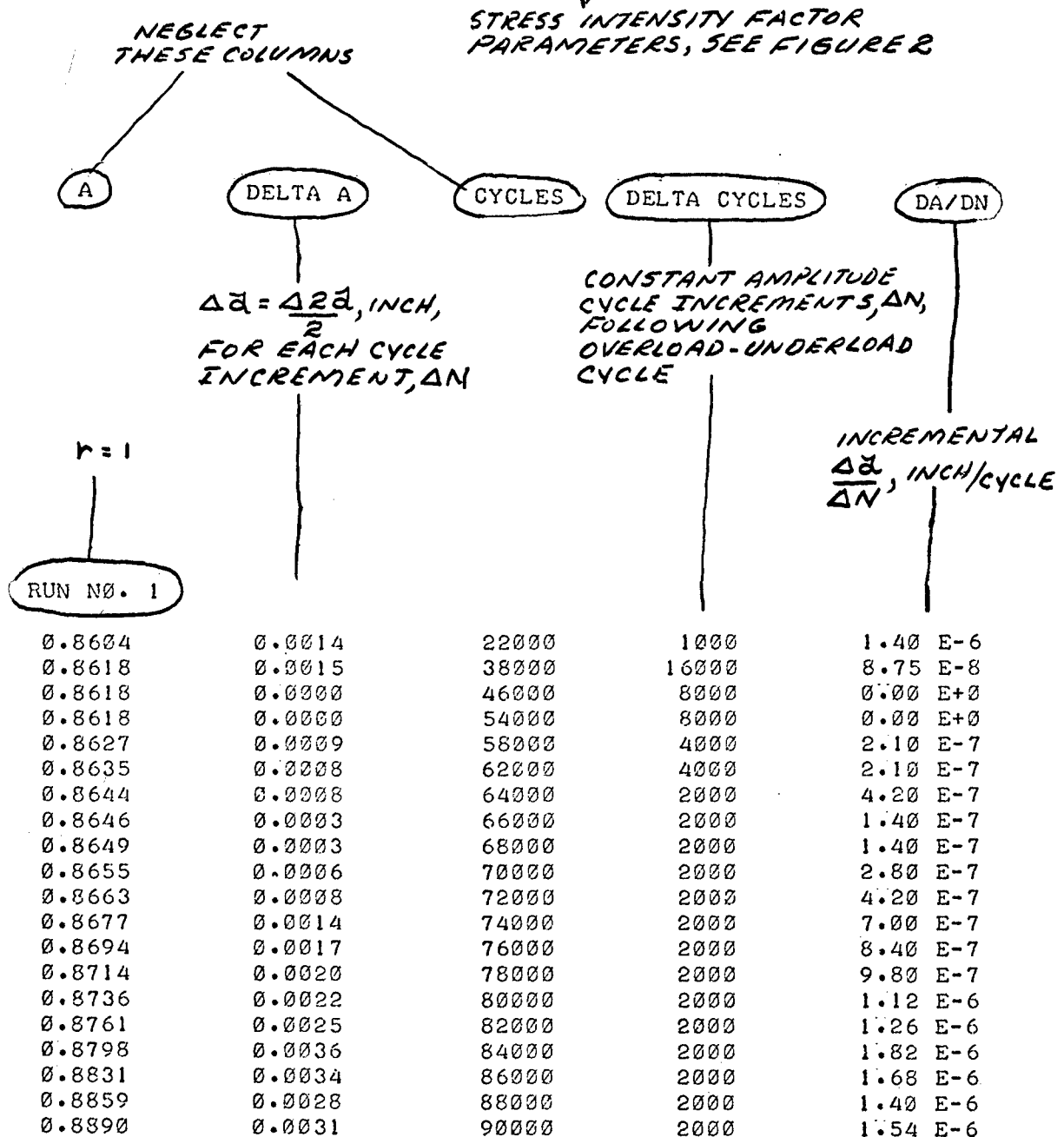


FIGURE 9 - TYPICAL INCREMENTAL DATA

$r=2$   
 RUN NO. 2

0.9150	0.0006	109000	1000	5.60 E-7
0.9153	0.0003	125000	16000	1.75 E-8
0.9159	0.0006	133000	8000	7.00 E-8
0.9164	0.0006	141000	8000	7.00 E-8
0.9167	0.0003	145000	4000	7.00 E-8
0.9170	0.0003	149000	4000	7.00 E-8
0.9176	0.0006	151000	2000	2.80 E-7
0.9190	0.0014	153000	2000	7.00 E-7
0.9204	0.0014	155000	2000	7.00 E-7
0.9223	0.0020	157000	2000	9.80 E-7
0.9251	0.0028	159000	2000	1.40 E-6
0.9279	0.0028	161000	2000	1.40 E-6
0.9293	0.0014	163000	2000	7.00 E-7
0.9330	0.0036	165000	2000	1.82 E-6
0.9360	0.0031	167000	2000	1.54 E-6
0.9391	0.0031	169000	2000	1.54 E-6
0.9422	0.0031	171000	2000	1.54 E-6
0.9450	0.0028	173000	2000	1.40 E-6
0.9478	0.0028	175000	2000	1.40 E-6
0.9506	0.0028	177000	2000	1.40 E-6

$r=3=R$   
 RUN NO. 3

0.9624	0.0008	186000	1000	8.40 E-7
0.9635	0.0011	202000	16000	7.00 E-8
0.9638	0.0003	210000	8000	3.50 E-8
0.9646	0.0008	218000	8000	1.05 E-7
0.9649	0.0003	222000	4000	7.00 E-8
0.9649	0.0000	226000	4000	0.00 E+0
0.9652	0.0003	228000	2000	1.40 E-7
0.9654	0.0003	230000	2000	1.40 E-7
0.9660	0.0006	232000	2000	2.80 E-7
0.9682	0.0022	234000	2000	1.12 E-6
0.9696	0.0014	236000	2000	7.00 E-7
0.9710	0.0014	238000	2000	7.00 E-7
0.9741	0.0031	240000	2000	1.54 E-6
0.9789	0.0048	242000	2000	2.38 E-6
0.9825	0.0036	244000	2000	1.82 E-6
0.9856	0.0031	246000	2000	1.54 E-6
0.9884	0.0028	248000	2000	1.40 E-6
0.9909	0.0025	250000	2000	1.26 E-6
0.9929	0.0020	252000	2000	9.80 E-7
0.9954	0.0025	254000	2000	1.26 E-6

FIGURE 9 - (cont'd) TYPICAL INCREMENTAL DATA

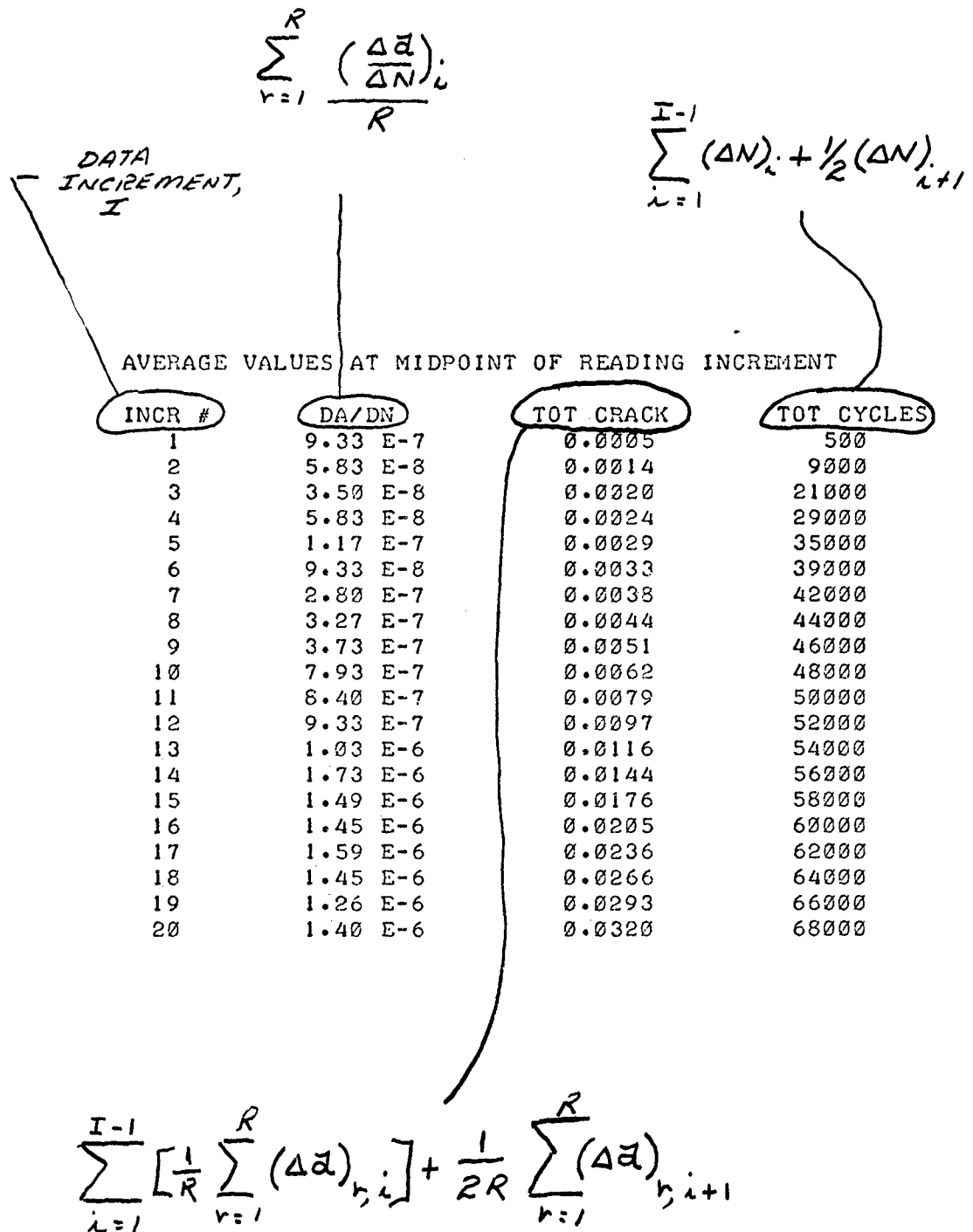


FIGURE 10 - AVERAGE DATA FOR THREE RUNS IN FIGURE 9 REFERENCED TO MIDPOINTS OF MEASUREMENT INCREMENTS

$$\sum_{i=1}^I \left( \sum_{r=1}^R \frac{(\Delta \tilde{a})_{r,i}}{R} \right)$$

AVERAGE VALUES AT END OF READING INCREMENT

DATA INCREMENT, $I$	TOT CRACK	TOT CYCLES
1	0.0009	1000
2	0.0019	17000
3	0.0022	25000
4	0.0026	33000
5	0.0031	37000
6	0.0035	41000
7	0.0041	43000
8	0.0047	45000
9	0.0055	47000
10	0.0070	49000
11	0.0087	51000
12	0.0106	53000
13	0.0126	55000
14	0.0161	57000
15	0.0191	59000
16	0.0220	61000
17	0.0251	63000
18	0.0280	65000
19	0.0306	67000
20	0.0334	69000

FIGURE 11 - AVERAGE DATA FOR THREE RUNS IN FIGURE 9 REFERENCED TO POINTS OF MEASUREMENT

SPECIMEN NO.	S	R	$\Delta K$	U	K <sub>1</sub>	K <sub>2</sub>	K <sub>3</sub>	K <sub>4</sub>	N <sub>D</sub>	a*, Inch
1-L-10	1.0	0.3	7	6.67	10	10	3	1.5	0	0
1-L-10	1.0	0.5	5	4	10	10	5	2.5	0	0
1-L-6	1.5	0.1	9	15	15	10	1	1	5500	0.017
1-L-18	1.5	0.3	7	10	15	10	3	1.5	5500	0.014
1-L-10	1.5	0.3	7	5	15	10	3	3	6500	0.016
1-L-2	1.5	0.5	5	6	15	10	5	2.5	12000	0.010
1-L-6	1.5	0.5	5	3	15	10	5	5	10000	0.006
3-L-13	2.0	0.1	9	20	20	10	1	1	16000	0.049
1-L-18	2.0	0.3	7	13.33	20	10	3	1.5	23000	0.035
1-L-10	2.0	0.3	7	6.67	20	10	3	3.0	23000	0.028
1-L-2	2.0	0.5	5	8	20	10	5	2.5	34000	0.014
1-L-6	2.0	0.5	5	4	20	10	5	5	58000	0.013
1-L-16	2.5	0.1	9	25	25	10	1	1	63000	0.087
1-L-2	2.5	0.3	7	16.67	25	10	3	1.5	100000	0.091
3-L-8	2.5	0.3	7	8.33	25	10	3	3	139000	0.059
5-L-6	2.9	0.3	7	9.67	29	10	3	3	(1)	
2-L-14	2.5	0.5	5	10	25	10	5	2.5	174000	0.024
4-L-4	2.4	0.5	5	4.8	24	10	5	5	(1)	
4-L-4	2.7	0.5	5	10.8	27	10	5	2.5	(1)	
4-L-8	3.0	0.1	9	30	30	10	1	1	255000	0.164 (2)
5-L-6	3.2	0.1	9	32	32	10	1	1	(1)	
1-L-13	3.0	0.3	7	20	30	10	3	1.5	668000	0.202 (2)
2-L-8	3.1	0.3	7	20.67	31	10	3	1.5	(1)	

(1) Overload shut-off ratio.

(2) Data for one crack tip.

FIGURE 12. RETARDATION PARAMETER DATA FOR 2219-T851 ALUMINUM ALLOY PLATE IN ROOM TEMPERATURE DESICCATED AIR FOR TENSION-TENSION LOAD CLASS



SPECIMEN NO.	S	R-	$\Delta K$	U	$K_1$	$K_2$	$K_3$	$K_4$	$N_D$	$a^*$ , Inch
6-L-20	1.5	0.5	7	3	21	14	7	7	8500	0.021
2-L-9	2.0	0.5	7	4	28	14	7	7	56000	0.033
3-L-10	2.3	0.5	7	4.6	32.2	14	7	7	(1)	
6-L-21	1.5	0.1	7	15	11.67	7.78	0.78	0.78	12000	0.015
5-L-20	2.0	0.1	7	20	15.56	7.78	0.78	0.78	26000	0.028
3-L-15	2.5	0.1	7	25	19.45	7.78	0.78	0.78	69000	0.039
3-L-10	3.0	0.1	7	30	23.34	7.78	0.78	0.78	(1)	

(1) Overload shut-off ratio.

FIGURE 13. RETARDATION PARAMETER DATA FOR 2219-T851 ALUMINUM ALLOY PLATE IN ROOM TEMPERATURE DEDICATED AIR FOR TENSION-TENSION LOAD CLASS -  $K_2=14$  and  $K_2=7.78$

SPECIMEN NO.	S	R	$\Delta K$	1/u	K <sub>1</sub>	K <sub>2</sub>	K <sub>3</sub>	K <sub>4</sub>	N <sub>D</sub>	a*, Inch
3-L-13	1.0	0.3	7	0	10	10	3	0	0	0
2-L-10	1.0	0.5	5	0	10	10	5	0	0	0
6-L-17	1.5	0.1	9	0	15	10	1	0	4500	0.015
3-L-13	1.5	0.3	7	0	15	10	3	0	5500	0.013
6-L-7	1.5	0.5	5	0	15	10	5	0	10000	0.009
6-L-7	2.0	0.1	9	0	20	10	1	0	16000	0.038
6-L-7	2.0	0.3	7	0	20	10	3	0	20000	0.031
6-L-7	2.0	0.5	5	0	20	10	5	0	36000	0.020
2-L-14	2.5	0.1	9	0	25	10	1	0	46000	0.046
3-L-19	2.5	0.3	7	0	25	10	3	0	81000	0.038
4-L-18	2.5	0.5	5	0	25	10	5	0	132000	0.034
3-L-4	3.0	0.3	7	0	30	10	3	0	(1)	(1)
1-L-1	2.9	0.5	5	0	29	10	5	0	(1)	(1)
2-L-16	3.0	0.1	9	0	30	10	1	0	172000	0.069 (2)
1-L-1	3.2	0.1	9	0	32	10	1	0	(1)	(1)

(1) Overload shut-off ratio.

(2) Data for one crack tip.

FIGURE 14. RETARDATION PARAMETER DATA FOR 2219-T851 ALUMINUM ALLOY PLATE IN ROOM TEMPERATURE DESICCATED AIR FOR TENSION-ZERO LOAD CLASS - K<sub>2</sub>=10

SPECIMEN NO.	S	R	$\Delta K$	1/U	K <sub>1</sub>	K <sub>2</sub>	K <sub>3</sub>	K <sub>4</sub>	N <sub>D</sub>	a*, Inch
6-L-20	1.5	0.5	7	0	21	14	7	0	3800	0.012
2-L-9	2.0	0.5	7	0	28	14	7	0	22000	0.046
5-L-3	2.5	0.5	7	0	35	14	7	0	127000	0.055 (1)
5-L-10	3.0	0.5	7	0	42	14	7	0	(2)	
5-L-20	1.5	0.1	7	0	11.67	7.78	0.78	0	8000	0.012
5-L-20	2.0	0.1	7	0	15.56	7.78	0.78	0	22000	0.022
5-L-20	2.5	0.1	7	0	19.45	7.78	0.78	0	60000	0.022
6-L-10	3.0	0.1	7	0	23.34	7.78	0.78	0	155000	0.030 (1)
5-L-3	3.4	0.1	7	0	26.45	7.78	0.78	0	(2)	

(1) Data for one crack tip.  
(2) Overload shut-off ratio.

FIGURE 15. RETARDATION PARAMETER DATA FOR 2219-T851 ALUMINUM ALLOY PLATE IN ROOM TEMPERATURE DESICCATED AIR FOR TENSION-ZERO LOAD CLASS -  $K_2=14$  AND  $K_2=7.78$

SPECIMEN NO.	S	R	$\Delta K$	1/u	K <sub>1</sub>	K <sub>2</sub>	K <sub>3</sub>	K <sub>4</sub>	N <sub>D</sub>	a*, Inch
2-L-10	1.5	0.3	7	0	15	10	3	0	7500	0.018
2-L-10	1.5	0.5	5	0	15	10	5	0	10000	0.006
2-L-10	2.0	0.3	7	0	20	10	3	0	24000	0.027
2-L-10	2.0	0.5	5	0	20	10	5	0	63000	0.022
1-L-20	2.5	0.3	7	0	25	10	3	0	92000	0.047
2-L-8	2.5	0.5	5	0	25	10	5	0	247000	0.032 (1)
1-L-1	2.6	0.5	5	0	26	10	5	0	(2)	(2)
1-L-20	3.0	0.3	7	0	30	10	3	0	494000	0.044
3-L-7	3.1	0.3	7	0	31	10	3	0	(2)	(2)

(1) Average of two runs, one run shut-off.

(2) Overload shut-off ratio.

FIGURE 16. RETARDATION PARAMETER DATA FOR 2219-T851 ALUMINUM ALLOY PLATE IN ROOM TEMPERATURE DESICCATED AIR FOR ZERO-TENSION LOAD CLASS - K<sub>2</sub>=10

SPECIMEN NO.	S	R	$\Delta K$	$U_c$	$K_1$	$K_2$	$K_3$	$K_5$	$N_D$	$a^*$ , Inch
5-L-17	1.5	0.1	9	-1.0	15	10	1	-15	4500	0.018
5-L-10	1.5	0.3	7	-1.0	15	10	3	-15	7500	0.019
5-L-17	1.5	0.5	5	-1.0	15	10	5	-15	10000	0.007
5-L-14	2.0	0.1	9	-1.0	20	10	1	-20	14000	0.042
5-L-10	2.0	0.3	7	-1.0	20	10	3	-20	22000	0.023
5-L-17	2.0	0.5	5	-1.0	20	10	5	-20	56000	0.014
3-L-18	2.5	0.1	9	-1.0	25	10	1	-25	48000	0.069
5-L-10	2.5	0.3	7	-1.0	25	10	3	-25	91000	0.020
5-L-12	2.5	0.5	5	-1.0	25	10	5	-25	(1)	(1)
3-L-16	3.0	0.1	9	-1.0	30	10	1	-30	281000	0.061
5-L-2	2.8	0.3	7	-1.0	28	10	3	-28	(1)	(1)
2-L-4	3.2	0.1	9	-1.0	32	10	1	-32	(1)	(1)

(1) Overload shut-off ratio.

FIGURE 17. RETARDATION PARAMETER DATA FOR 2219-T851 ALUMINUM ALLOY PLATE IN ROOM TEMPERATURE DESICCATED AIR FOR COMPRESSION-TENSION LOAD CLASS -  $K_2=10$

SPECIMEN NO.	S	R	$\Delta K$	$U_c$	$K_1$	$K_2$	$K_3$	$K_5$	$N_D$	$a^*$ , Inch
6-L-20	1.5	0.5	7	-1	21	14	7	-21	8500	0.018
3-L-14	2.0	0.5	7	-1	28	14	7	-28	60000	0.032
1-L-1	2.3	0.5	7	-1	32.2	14	7	-32.2	(1)	
6-L-21	1.5	0.1	7	-1	11.67	7.78	0.78	-11.67	6000	0.009
5-L-20	2.0	0.1	7	-1	15.56	7.78	0.78	-15.56	18000	0.013
3-L-15	2.5	0.1	7	-1	19.45	7.78	0.78	-19.45	55000	0.028
1-L-21	3.0	0.1	7	-1	23.34	7.78	0.78	-23.34	152000	0.043
4-L-21	3.1	0.1	7	-1	24.12	7.78	0.78	-24.12	(1)	

(1) Overload shut-off ratio.

FIGURE 18. RETARDATION PARAMETER DATA FOR 2219-T851 ALUMINUM ALLOY PLATE IN ROOM TEMPERATURE DESICCATED AIR FOR COMPRESSION-TENSION LOAD CLASS -  $K_2=14$  and  $K_2=7.78$

Specimen No.	S	R	$\Delta K$	$U_c$	$K_1$	$K_2$	$K_3$	$K_5$	$N_D$	$a^*$ , Inch
2-L-7	1.0	0.1	9	-0.67	10	10	1	-15	0	0
2-L-7	1.0	0.5	5	-0.67	10	10	5	-15	0	0
4-L-14	1.5	0.1	9	-1.0	15	10	1	-15	4500	0.017
4-L-14	1.5	0.1	9	-2.0	15	10	1	-7.5	4500	0.016
6-L-3	1.5	0.3	7	-1.0	15	10	3	-15	5500	0.015
6-L-3	1.5	0.3	7	-2.0	15	10	3	-7.5	6500	0.017
2-L-12	1.5	0.5	5	-1.0	15	10	5	-15	6000	0.007
5-L-2	1.5	0.5	5	-2.0	15	10	5	-7.5	6000	0.007
2-L-7	2.0	0.1	9	-1.0	20	10	1	-20	14000	0.048
2-L-7	2.0	0.1	9	-2.0	20	10	1	-10	16000	0.050
3-L-3	2.0	0.3	7	-1.0	20	10	3	-20	12000	0.029
5-L-17	2.0	0.3	7	-2.0	20	10	3	-10	14000	0.026
1-L-19	2.0	0.5	5	-1.0	20	10	5	-20	12000	0.012
3-L-18	2.0	0.5	5	-2.0	20	10	5	-10	16000	0.013
4-L-14	2.5	0.1	9	-1.0	25	10	1	-25	26000	0.051
6-L-13	2.5	0.1	9	-2.0	25	10	1	-12.5	29000	0.056
1-L-19	2.5	0.3	7	-1.0	25	10	3	-25	28000	0.057
6-L-12	2.5	0.3	7	-2.0	25	10	3	-12.5	26000	0.050
1-L-19	2.5	0.5	5	-1.0	25	10	5	-25	24000	0.015
6-L-12	2.5	0.5	5	-2.0	25	10	5	-12.5	37000	0.023
4-L-11	3.0	0.1	9	-1.0	30	10	1	-30	51000	0.103
2-L-12	3.0	0.1	9	-2.0	30	10	1	-15	83000	0.091
4-L-11	3.0	0.3	7	-1.0	30	10	3	-30	66000	0.077
5-L-7	3.0	0.3	7	-2.0	30	10	3	-15	88000	0.090
5-L-7	3.0	0.5	5	-1.0	30	10	5	-30	60000	0.041
5-L-14	3.0	0.5	5	-2.0	30	10	5	-15	111000	0.043
3-L-7	3.5	0.1	9	-1.0	35	10	1	-35	116000	0.174
3-L-7	3.5	0.1	9	-2.0	35	10	1	-17.5	251000	0.127 (I)
6-L-15	3.5	0.3	7	-1.0	35	10	3	-35	111000	0.169
2-L-3	3.5	0.3	7	-2.0	35	10	3	-17.5	272000	0.211 (I)
6-L-15	3.5	0.5	5	-1.0	35	10	5	-35	147000	0.096 (I)
2-L-3	3.5	0.5	5	-2.0	35	10	5	-17.5	635000	0.261
2-L-17	4.0	0.1	9	-1.0	40	10	1	-40	95000	0.206
1-L-5	4.0	0.1	9	-2.0	40	10	1	-20	187000	0.321
5-L-21	4.0	0.3	7	-1.0	40	10	3	-40	165000	0.224 (I)
5-L-21	4.0	0.3	7	-2.0	40	10	3	-20	707000	0.319 (I)
5-L-21	4.0	0.5	5	-1.0	40	10	5	-40	326000	0.240
2-L-6	4.0	0.5	5	-2.0	40	10	5	-20	1430000	0.303 (I)

(I) Data for one crack tip.

FIGURE 19. RETARDATION PARAMETER DATA FOR 2219-T851 ALUMINUM ALLOY PLATE IN ROOM TEMPERATURE DESICCATED AIR FOR TENSION-COMPRESSION LOAD CLASS -  $K_2=10$

SPECIMEN NO.	S	R	$\Delta K$	$V_c$	$K_1$	$K_2$	$K_3$	$K_5$	$N_D$	$a^*$ , Inch
6-L-20	1.5	0.5	7	-1	21	14	7	-21	8500	0.032
6-L-20	1.5	0.5	7	-2	21	14	7	-10.5	7500	0.027
3-L-14	2.0	0.5	7	-1	28	14	7	-28	6500	0.018
2-L-9	2.0	0.5	7	-2	28	14	7	-14	14000	0.034
3-L-14	2.5	0.5	7	-1	35	14	7	-35	28000	0.063
3-L-17	2.5	0.5	7	-2	35	14	7	-17.5	45000	0.092
6-L-1	3.0	0.5	7	-1	42	14	7	-42	50000	0.110
5-L-3	3.0	0.5	7	-2	42	14	7	-21	151000	0.180 (1)
6-L-1	3.5	0.5	7	-1	49	14	7	-49	246000	0.533 (1)
1-L-5	3.5	0.5	7	-2	49	14	7	-24.5	276000	0.490
2-L-17	4.0	0.5	7	-1	56	14	7	-56	316000	0.703
6-L-21	1.5	0.1	7	-1	11.67	7.78	0.78	-11.67	8000	0.012
6-L-21	1.5	0.1	7	-2	11.67	7.78	0.78	-5.84	9000	0.012
5-L-20	2.0	0.1	7	-1	15.56	7.78	0.78	-15.56	14000	0.016
5-L-20	2.0	0.1	7	-2	15.56	7.78	0.78	-7.78	16000	0.015
3-L-15	2.5	0.1	7	-1	19.45	7.78	0.78	-19.45	36000	0.034
3-L-15	2.5	0.1	7	-2	19.45	7.78	0.78	-9.72	40000	0.024
2-L-19	3.0	0.1	7	-1	23.34	7.78	0.78	-23.34	42000	0.049
4-L-21	3.0	0.1	7	-2	23.34	7.78	0.78	-11.67	92000	0.047
2-L-19	3.5	0.1	7	-1	27.23	7.78	0.78	-27.23	102000	0.037
2-L-16	3.5	0.1	7	-2	27.23	7.78	0.78	-13.62	172000	0.108 (1)
2-L-19	4.0	0.1	7	-1	31.12	7.78	0.78	-31.12	266000	0.061 (1)
6-L-1	4.0	0.1	7	-2	31.12	7.78	0.78	-15.56	246000	0.109 (1)
6-L-1	4.5	0.1	7	-1	35.01	7.78	0.78	-35.01	452000	0.107 (1)
4-L-7	4.1	0.1	7	-2	31.90	7.78	0.78	-15.95	(2)	(2)
4-L-7	5.0	0.1	7	-1	38.90	7.78	0.78	-38.90	(2)	(2)

(1) Data for one crack tip.

(2) Overload shut-off ratio.

FIGURE 20. RETARDATION PARAMETER DATA FOR 2219-T851 ALUMINUM ALLOY PLATE IN ROOM TEMPERATURE DESICCATED AIR FOR TENSION-COMPRESSION LOAD CLASS -  $K_2=14$  AND  $K_2=7.78$



SPECIMEN NO.	S	R	$\Delta K$	$U_c$	$K_1$	$K_2$	$K_3$	$K_5$	$N_D$	$a$ , Inch
4-L-14	1.5	0.1	9	-2	15	10	1	-7.5	4500	0.016 (1)
6-L-3	1.5	0.3	7	-2	15	10	3	-7.5	6500	0.017 (1)
5-L-2	1.5	0.5	5	-2	15	10	5	-7.5	6000	0.007 (1)
6-L-18	2.0	0.1	9	-2.67	20	10	1	-7.5	14000	0.043
6-L-18	2.0	0.3	7	-2.67	20	10	3	-7.5	20000	0.043
6-L-18	2.0	0.5	5	-2.67	20	10	5	-7.5	28000	0.020
6-L-6	2.5	0.1	9	-3.33	25	10	1	-7.5	36000	0.066
6-L-6	2.5	0.3	7	-3.33	25	10	3	-7.5	42000	0.054
2-L-2	2.5	0.5	5	-3.33	25	10	5	-7.5	68000	0.047
2-L-2	3.0	0.1	9	-4	30	10	1	-7.5	92000	0.091
6-L-16	3.0	0.3	7	-4	30	10	3	-7.5	142000	0.125
4-L-8	3.0	0.5	5	-4	30	10	5	-7.5	171000	0.090
4-L-1	3.7	0.1	9	-4.93	37	10	1	-7.5	(2)	(2)
3-L-5	3.6	0.3	7	-4.8	36	10	3	-7.5	(2)	(2)
3-L-5	3.5	0.5	5	-4.67	35	10	5	-7.5	(2)	(2)

(1) Data from basic program.

(2) Overload shut-off ratio.

FIGURE 21. RETARDATION PARAMETER DATA FOR 2219-T851 ALUMINUM ALLOY PLATE IN ROOM TEMPERATURE DESICCATED AIR FOR TENSION-COMPRESSION LOAD CLASS -  $K_2=10$  AND  $K_5=-7.5$

## HOLD TIME EFFECTS

Specimen No.	S	R	$\Delta K$	U	$K_1$	$K_2$	$K_3$	$K_4$	Time Hours	$K_I$	$N_D$	$a^*$ , Inch
6-L-14	2.0	0.1	9	20	20	10	1	1	0		16000	0.042
6-L-14	2.0	0.1	9	20	20	10	1	1	0.0014		16000	0.033
6-L-14	2.0	0.1	9	20	20	10	1	1	0.25		22000	0.042
6-L-14	2.0	0.1	9	20	20	10	1	1	1.0		22000	0.035
5-L-11	2.0	0.1	9	20	20	10	1	1	24		28000	0.038
6-L-14	2.5	0.1	0	25	25	10	1	1	0		43000	0.043
6-L-14	2.5	0.1	9	25	25	10	1	1	0.25		70000	0.044
6-L-14	2.5	0.1	9	25	25	10	1	1	1.0		89000	0.029
6-L-14	2.5	0.1	9	25	25	10	1	1	4.0		102000	0.048 (1)
2-L-6	2.5	0.1	9	25	25	10	1	1	24		127000	0.032
2-L-4	2.57	0.13	6.78	20	25.7	7.78	1	1	0		72000	0.027
2-L-4	2.57	0.13	6.78	20	25.7	7.78	1	1	0.25		102000	0.017 (1)
2-L-4	2.57	0.13	6.78	20	25.7	7.78	1	1	1.0		106000	0.018 (1)
2-L-4	2.57	0.13	6.78	20	25.7	7.78	1	1	4.0		138000	0.015 (1)
2-L-4	2.57	0.13	6.78	20	25.7	7.78	1	1	24		178000	0.019 (1)
5-L-11	2.0	0.5	5	20	20	10	5	1	0		24000	0.014
5-L-11	2.0	0.5	5	20	20	10	5	1	0.25		48000	0.017
5-L-11	2.0	0.5	5	20	20	10	5	1	1.0		42000	0.021
5-L-11	2.0	0.5	5	20	20	10	5	1	4.0		52000	0.018
5-L-11	2.0	0.5	5	20	20	10	5	1	24		68000	0.022
3-L-16	2.0	0.5	5	4	20	10	5	5	0		48000	0.016
3-L-16	2.0	0.5	5	4	20	10	5	5	0.25		87000	0.010
3-L-16	2.0	0.5	5	4	20	10	5	5	1.0		103000	0.017
3-L-16	2.0	0.5	5	4	20	10	5	5	4.0		139000	0.029
5-L-11	2.0	0.5	5	4	20	10	5	5	24		568000	0.012 (1)

(1) Data for one crack tip.

FIGURE 22. RETARDATION PARAMETER DATA FOR 2219-T851 ALUMINUM ALLOY PLATE IN ROOM TEMPERATURE DESICCATED AIR FOR TENSION-TENSION LOAD CLASS - HOLD TIME EFFECTS

## HOLD TIME EFFECTS

Specimen No.	S	R	$\Delta K$	$U_c$	$K_1$	$K_2$	$K_3$	$K_5$	Time $K_5$ Hours	$N_D$	$a^*$ , Inch
4-L-1	2.0	0.1	9	-0.8	20	10	1	-25	0	8500	0.029
4-L-1	2.0	0.1	9	-0.8	20	10	1	-25	0.25	6500	0.024
4-L-1	2.0	0.1	9	-0.8	20	10	1	-25	1.0	7500	0.029
4-L-1	2.0	0.1	9	-0.8	20	10	1	-25	24	8500	0.036
4-L-14	2.5	0.1	9	-1.0	25	10	1	-25	0	26000	0.051 (I)
5-L-11	2.5	0.1	9	-1.0	25	10	1	-25	0.25	14000	0.041
5-L-11	2.5	0.1	9	-1.0	25	10	1	-25	1.0	14000	0.040
5-L-11	2.5	0.1	9	-1.0	25	10	1	-25	24	12000	0.038
2-L-6	3.21	0.13	6.78	-1.0	25	7.78	1	-25	0	52000	0.024
2-L-6	3.21	0.13	6.78	-1.0	25	7.78	1	-25	0.25	45000	0.042
2-L-6	3.21	0.13	6.78	-1.0	25	7.78	1	-25	1.0	40000	0.042
2-L-6	3.21	0.13	6.78	-1.0	25	7.78	1	-25	24	54000	0.057
1-L-19	2.5	0.5	5	-1.0	25	10	5	-25	0	24000	0.015 (I)
4-L-1	2.5	0.5	5	-1.0	25	10	5	-25	0.25	24000	0.016
4-L-1	2.5	0.5	5	-1.0	25	10	5	-25	1.0	24000	0.016
4-L-1	2.5	0.5	5	-1.0	25	10	5	-25	24	24000	0.026
6-L-13	2.5	0.1	9	-2.0	25	10	1	-12.5	0	29000	0.056 (I)
1-L-9	2.5	0.1	9	-2.0	25	10	1	-12.5	0.25	24000	0.050
1-L-9	2.5	0.1	9	-2.0	25	10	1	-12.5	1.0	22000	0.053
1-L-9	2.5	0.1	9	-2.0	25	10	1	-12.5	24	20000	0.060

(I) Data from basic program.

FIGURE 23. RETARDATION PARAMETER DATA FOR 2219-T851 ALUMINUM ALLOY PLATE IN ROOM TEMPERATURE DESICCATED AIR FOR TENSION-COMPRESSION LOAD CLASS - HOLD TIME EFFECTS

Data Tabulations for Tension-Tension Load Class,  
 $K_2=10 \text{ KSI } \sqrt{\text{In.}}$

TABLE 1  
EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
TEMPERATURE DESICCATED AIR  
SPECIMEN NO. 1-L-10, TENSION-TENSION  
F=12Hz, K2=10, R=0.3, U=6.67 S=1.0

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.5813	0.0028	14250	1000	2.80 E-6
0.5841	0.0028	15250	1000	2.80 E-6
0.5880	0.0039	16250	1000	3.92 E-6
0.5914	0.0034	17250	1000	3.36 E-6
0.5947	0.0034	18250	1000	3.36 E-6
0.5992	0.0045	19250	1000	4.48 E-6
0.6014	0.0022	20250	1000	2.24 E-6
0.6054	0.0039	21250	1000	3.92 E-6
RUN NO. 2				
0.6093	0.0039	22250	1000	3.92 E-6
0.6126	0.0034	23250	1000	3.36 E-6
0.6166	0.0039	24250	1000	3.92 E-6
0.6199	0.0034	25250	1000	3.36 E-6
0.6233	0.0034	26250	1000	3.36 E-6
0.6272	0.0039	27250	1000	3.92 E-6
0.6306	0.0034	28250	1000	3.36 E-6
0.6339	0.0034	29250	1000	3.36 E-6
RUN NO. 3				
0.6373	0.0034	30250	1000	3.36 E-6
0.6406	0.0034	31250	1000	3.36 E-6
0.6434	0.0028	32250	1000	2.80 E-6
0.6474	0.0039	33250	1000	3.92 E-6
0.6507	0.0034	34250	1000	3.36 E-6
0.6530	0.0022	35250	1000	2.24 E-6
0.6563	0.0034	36250	1000	3.36 E-6
0.6597	0.0034	37250	1000	3.36 E-6

AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	3.36 E-6	0.0017	500
2	3.17 E-6	0.0050	1500
3	3.55 E-6	0.0083	2500
4	3.55 E-6	0.0119	3500
5	3.36 E-6	0.0154	4500
6	3.55 E-6	0.0188	5500
7	2.99 E-6	0.0221	6500
8	3.55 E-6	0.0254	7500

AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0034	1000
2	0.0066	2000
3	0.0101	3000
4	0.0137	4000
5	0.0171	5000
6	0.0206	6000
7	0.0236	7000
8	0.0272	8000

TABLE 2  
EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
TEMPERATURE DESICCATED AIR  
SPECIMEN NO. 1-L-10, TENSION-TENSION  
F=12Hz, K2=10, R=0.5, U=4.0, S=1.0

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.5456	0.0034	8750	2000	1.68 E-6
1.5490	0.0034	10750	2000	1.68 E-6
1.5523	0.0034	12750	2000	1.68 E-6
1.5546	0.0022	14750	2000	1.12 E-6
1.5574	0.0028	16750	2000	1.40 E-6
1.5607	0.0034	18750	2000	1.68 E-6
1.5635	0.0028	20750	2000	1.40 E-6
RUN NO. 2				
1.5669	0.0034	22750	2000	1.68 E-6
1.5691	0.0022	24750	2000	1.12 E-6
1.5719	0.0028	26750	2000	1.40 E-6
1.5747	0.0028	28750	2000	1.40 E-6
1.5770	0.0022	30750	2000	1.12 E-6
1.5798	0.0028	32750	2000	1.40 E-6
1.5826	0.0028	34750	2000	1.40 E-6
RUN NO. 3				
1.5848	0.0022	36750	2000	1.12 E-6
1.5870	0.0022	38750	2000	1.12 E-6
1.5893	0.0022	40750	2000	1.12 E-6
1.5921	0.0028	42750	2000	1.40 E-6
1.5949	0.0028	44750	2000	1.40 E-6
1.5971	0.0022	46750	2000	1.12 E-6
1.5994	0.0022	48750	2000	1.12 E-6
RUN NO. 4				
1.6038	0.0022	52750	2000	1.12 E-6
1.6066	0.0028	54750	2000	1.40 E-6
1.6100	0.0034	56750	2000	1.68 E-6
1.6134	0.0034	58750	2000	1.68 E-6
1.6162	0.0028	60750	2000	1.40 E-6
1.6190	0.0028	62750	2000	1.40 E-6
1.6212	0.0022	64750	2000	1.12 E-6

TABLE 2 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	1.40 E-6	0.0014	1000
2	1.33 E-6	0.0041	3000
3	1.47 E-6	0.0069	5000
4	1.40 E-6	0.0098	7000
5	1.33 E-6	0.0125	9000
6	1.40 E-6	0.0153	11000
7	1.26 E-6	0.0179	13000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0028	2000
2	0.0055	4000
3	0.0084	6000
4	0.0112	8000
5	0.0139	10000
6	0.0167	12000
7	0.0192	14000

STOP AT LINE 799

READY

TABLE 3  
EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
TEMPERATURE DESICCATED AIR  
SPECIMEN NO. 1-L-6, TENSION-TENSION  
F=12Hz, K2=10, R=0.1, U=15, S=1.5

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.1211	0.0028	15250	1000	2.80 E-6
1.1234	0.0022	16250	1000	2.24 E-6
1.1256	0.0022	17250	1000	2.24 E-6
1.1290	0.0034	18250	1000	3.36 E-6
1.1323	0.0034	19250	1000	3.36 E-6
1.1357	0.0034	20250	1000	3.36 E-6
1.1407	0.0050	21250	1000	5.04 E-6
1.1458	0.0050	22250	1000	5.04 E-6
1.1502	0.0045	23250	1000	4.48 E-6
1.1542	0.0039	24250	1000	3.92 E-6
RUN NO. 2				
1.1648	0.0028	27250	1000	2.80 E-6
1.1670	0.0022	28250	1000	2.24 E-6
1.1704	0.0034	29250	1000	3.36 E-6
1.1732	0.0028	30250	1000	2.80 E-6
1.1766	0.0034	31250	1000	3.36 E-6
1.1816	0.0050	32250	1000	5.04 E-6
1.1855	0.0039	33250	1000	3.92 E-6
1.1889	0.0034	34250	1000	3.36 E-6
1.1939	0.0050	35250	1000	5.04 E-6
1.1984	0.0045	36250	1000	4.48 E-6
RUN NO. 3				
1.2018	0.0034	37250	1000	3.36 E-6
1.2040	0.0022	38250	1000	2.24 E-6
1.2074	0.0034	39250	1000	3.36 E-6
1.2107	0.0034	40250	1000	3.36 E-6
1.2135	0.0028	41250	1000	2.80 E-6
1.2174	0.0039	42250	1000	3.92 E-6
1.2219	0.0045	43250	1000	4.48 E-6
1.2275	0.0056	44250	1000	5.60 E-6
1.2320	0.0045	45250	1000	4.48 E-6
1.2359	0.0039	46250	1000	3.92 E-6



TABLE 3 (continued)

RUN NO. 4

1.2398	0.0039	47250	1000	3.92 E-6
1.2421	0.0022	48250	1000	2.24 E-6
1.2449	0.0028	49250	1000	2.80 E-6
1.2482	0.0034	50250	1000	3.36 E-6
1.2510	0.0028	51250	1000	2.80 E-6
1.2561	0.0050	52250	1000	5.04 E-6
1.2611	0.0050	53250	1000	5.04 E-6
1.2656	0.0045	54250	1000	4.48 E-6
1.2706	0.0050	55250	1000	5.04 E-6
1.2751	0.0045	56250	1000	4.48 E-6

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	3.22 E-6	0.0016	500
2	2.24 E-6	0.0043	1500
3	2.94 E-6	0.0069	2500
4	3.22 E-6	0.0100	3500
5	3.08 E-6	0.0132	4500
6	4.34 E-6	0.0169	5500
7	4.62 E-6	0.0214	6500
8	4.62 E-6	0.0260	7500
9	4.76 E-6	0.0307	8500
10	4.20 E-6	0.0351	9500

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0032	1000
2	0.0055	2000
3	0.0084	3000
4	0.0116	4000
5	0.0147	5000
6	0.0190	6000
7	0.0237	7000
8	0.0283	8000
9	0.0330	9000
10	0.0372	10000

TABLE 4  
EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
TEMPERATURE DESICCATED AIR  
SPECIMEN NO. 1-L-18, TENSION-TENSION  
F=12Hz, K2=10, R=0.3, U=10 S=1.5

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.7538	0.0028	8000	1000	2.80 E-6
0.7605	0.0017	9000	1000	1.68 E-6
0.7627	0.0022	10000	1000	2.24 E-6
0.7655	0.0028	11000	1000	2.80 E-6
0.7689	0.0034	12000	1000	3.36 E-6
0.7711	0.0022	13000	1000	2.24 E-6
0.7750	0.0039	14000	1000	3.92 E-6
0.7792	0.0039	15000	1000	3.92 E-6
0.7812	0.0022	16000	1000	2.24 E-6
0.7846	0.0034	17000	1000	3.36 E-6
RUN NO. 2				
0.8148	0.0022	26000	1000	2.24 E-6
0.8165	0.0017	27000	1000	1.68 E-6
0.8193	0.0028	28000	1000	2.80 E-6
0.8215	0.0022	29000	1000	2.24 E-6
0.8243	0.0028	30000	1000	2.80 E-6
0.8277	0.0034	31000	1000	3.36 E-6
0.8310	0.0034	32000	1000	3.36 E-6
0.8338	0.0028	33000	1000	2.80 E-6
0.8361	0.0022	34000	1000	2.24 E-6
0.8394	0.0034	35000	1000	3.36 E-6
RUN NO. 3				
0.8462	0.0039	37000	1000	3.92 E-6
0.8478	0.0017	38000	1000	1.68 E-6
0.8501	0.0022	39000	1000	2.24 E-6
0.8518	0.0017	40000	1000	1.68 E-6
0.8540	0.0022	41000	1000	2.24 E-6
0.8585	0.0045	42000	1000	4.48 E-6
0.8618	0.0034	43000	1000	3.36 E-6
0.8663	0.0045	44000	1000	4.48 E-6
0.8697	0.0034	45000	1000	3.36 E-6
0.8730	0.0034	46000	1000	3.36 E-6

TABLE 4 (continued)

## RUN NO. 4

0.8793	0.0028	48000	1000	2.80 E-6
0.8820	0.0022	49000	1000	2.24 E-6
0.8848	0.0028	50000	1000	2.80 E-6
0.8876	0.0028	51000	1000	2.80 E-6
0.8898	0.0022	52000	1000	2.24 E-6
0.8932	0.0034	53000	1000	3.36 E-6
0.8966	0.0034	54000	1000	3.36 E-6
0.8999	0.0034	55000	1000	3.36 E-6
0.9038	0.0039	56000	1000	3.92 E-6
0.9072	0.0034	57000	1000	3.36 E-6

## RUN NO. 5

0.9100	0.0028	58000	1000	2.80 E-6
0.9111	0.0011	59000	1000	1.12 E-6
0.9145	0.0034	60000	1000	3.36 E-6
0.9167	0.0022	61000	1000	2.24 E-6
0.9190	0.0022	62000	1000	2.24 E-6
0.9229	0.0039	63000	1000	3.92 E-6
0.9257	0.0028	64000	1000	2.80 E-6
0.9290	0.0034	65000	1000	3.36 E-6
0.9318	0.0028	66000	1000	2.80 E-6
0.9358	0.0039	67000	1000	3.92 E-6

## RUN NO. 6

0.9402	0.0045	68000	1000	4.48 E-6
0.9414	0.0011	69000	1000	1.12 E-6
0.9430	0.0017	70000	1000	1.68 E-6
0.9458	0.0028	71000	1000	2.80 E-6
0.9486	0.0028	72000	1000	2.80 E-6
0.9514	0.0028	73000	1000	2.80 E-6
0.9554	0.0039	74000	1000	3.92 E-6
0.9587	0.0034	75000	1000	3.36 E-6
0.9621	0.0034	76000	1000	3.36 E-6
0.9654	0.0034	77000	1000	3.36 E-6

## RUN NO. 7

0.9688	0.0034	78000	1000	3.36 E-6
0.9710	0.0022	79000	1000	2.24 E-6
0.9733	0.0022	80000	1000	2.24 E-6
0.9755	0.0022	81000	1000	2.24 E-6
0.9794	0.0039	82000	1000	3.92 E-6
0.9834	0.0039	83000	1000	3.92 E-6
0.9867	0.0034	84000	1000	3.36 E-6
0.9895	0.0028	85000	1000	2.80 E-6
0.9940	0.0045	86000	1000	4.48 E-6
0.9979	0.0039	87000	1000	3.92 E-6

TABLE 4 (continued)

## RUN NO. 8

1.0108	0.0034	91000	1000	3.36 E-6
1.0125	0.0017	92000	1000	1.68 E-6
1.0142	0.0017	93000	1000	1.68 E-6
1.0170	0.0028	94000	1000	2.80 E-6
1.0203	0.0034	95000	1000	3.36 E-6
1.0237	0.0034	96000	1000	3.36 E-6
1.0270	0.0034	97000	1000	3.36 E-6
1.0304	0.0034	98000	1000	3.36 E-6
1.0338	0.0034	99000	1000	3.36 E-6
1.0377	0.0039	100000	1000	3.92 E-6

## RUN NO. 9

1.0394	0.0017	101000	1000	1.68 E-6
1.0413	0.0017	102000	1000	1.68 E-6
1.0438	0.0028	103000	1000	2.80 E-6
1.0461	0.0022	104000	1000	2.24 E-6
1.0500	0.0039	105000	1000	3.92 E-6
1.0534	0.0034	106000	1000	3.36 E-6
1.0567	0.0034	107000	1000	3.36 E-6
1.0601	0.0034	108000	1000	3.36 E-6
1.0634	0.0034	109000	1000	3.36 E-6
1.0668	0.0034	110000	1000	3.36 E-6

## RUN NO. 10

1.0696	0.0028	111000	1000	2.80 E-6
1.0713	0.0017	112000	1000	1.68 E-6
1.0735	0.0022	113000	1000	2.24 E-6
1.0758	0.0022	114000	1000	2.24 E-6
1.0786	0.0028	115000	1000	2.80 E-6
1.0808	0.0022	116000	1000	2.24 E-6
1.0853	0.0045	117000	1000	4.48 E-6
1.0881	0.0028	118000	1000	2.80 E-6
1.0914	0.0034	119000	1000	3.36 E-6
1.0948	0.0034	120000	1000	3.36 E-6

TABLE 4 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	3.02 E-6	0.0015	500
2	1.68 E-6	0.0039	1500
3	2.41 E-6	0.0059	2500
4	2.41 E-6	0.0083	3500
5	2.97 E-6	0.0110	4500
6	3.33 E-6	0.0141	5500
7	3.53 E-6	0.0176	6500
8	3.36 E-6	0.0210	7500
9	3.25 E-6	0.0243	8500
10	3.53 E-6	0.0277	9500

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0033	1000
2	0.0047	2000
3	0.0071	3000
4	0.0095	4000
5	0.0125	5000
6	0.0158	6000
7	0.0193	7000
8	0.0227	8000
9	0.0259	9000
10	0.0295	10000

TABLE 5

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 1-L-10, TENSION-TENSION  
 F=12Hz, K2=10, R=0.3, U=5, S=1.5

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.5214	0.0045	6750	1000	4.48 E-6
0.5230	0.0017	7750	1000	1.68 E-6
0.5247	0.0017	8750	1000	1.68 E-6
0.5270	0.0022	9750	1000	2.24 E-6
0.5298	0.0028	10750	1000	2.80 E-6
0.5326	0.0028	11750	1000	2.80 E-6
0.5370	0.0045	12750	1000	4.48 E-6
0.5398	0.0028	13750	1000	2.80 E-6
0.5432	0.0034	14750	1000	3.36 E-6
0.5460	0.0028	15750	1000	2.80 E-6
0.5488	0.0028	16750	1000	2.80 E-6
0.5522	0.0034	17750	1000	3.36 E-6
RUN NO. 2				
0.5617	0.0022	20750	1000	2.24 E-6
0.5639	0.0022	21750	1000	2.24 E-6
0.5650	0.0011	22750	1000	1.12 E-6
0.5684	0.0034	23750	1000	3.36 E-6
0.5706	0.0022	24750	1000	2.24 E-6
0.5734	0.0028	25750	1000	2.80 E-6
0.5768	0.0034	26750	1000	3.36 E-6
0.5807	0.0039	27750	1000	3.92 E-6
0.5835	0.0028	28750	1000	2.80 E-6
0.5858	0.0022	29750	1000	2.24 E-6
0.5902	0.0045	30750	1000	4.48 E-6
0.5936	0.0034	31750	1000	3.36 E-6
RUN NO. 3				
0.5958	0.0022	32750	1000	2.24 E-6
0.5981	0.0022	33750	1000	2.24 E-6
0.5998	0.0017	34750	1000	1.68 E-6
0.6026	0.0028	35750	1000	2.80 E-6
0.6054	0.0028	36750	1000	2.80 E-6
0.6087	0.0034	37750	1000	3.36 E-6
0.6115	0.0028	38750	1000	2.80 E-6
0.6143	0.0028	39750	1000	2.80 E-6
0.6182	0.0039	40750	1000	3.92 E-6
0.6222	0.0039	41750	1000	3.92 E-6
0.6255	0.0034	42750	1000	3.36 E-6
0.6289	0.0034	43750	1000	3.36 E-6

TABLE 5 (continued)

## .RUN NO. 4

0.6306	0.0017	44750	1000	1.68 E-6
0.6322	0.0017	45750	1000	1.68 E-6
0.6345	0.0022	46750	1000	2.24 E-6
0.6373	0.0028	47750	1000	2.80 E-6
0.6401	0.0028	48750	1000	2.80 E-6
0.6423	0.0022	49750	1000	2.24 E-6
0.6457	0.0034	50750	1000	3.36 E-6
0.6490	0.0034	51750	1000	3.36 E-6
0.6524	0.0034	52750	1000	3.36 E-6
0.6558	0.0034	53750	1000	3.36 E-6
0.6591	0.0034	54750	1000	3.36 E-6
0.6625	0.0034	55750	1000	3.36 E-6

## RUN NO. 5

0.6642	0.0017	56750	1000	1.68 E-6
0.6653	0.0011	57750	1000	1.12 E-6
0.6675	0.0022	58750	1000	2.24 E-6
0.6703	0.0028	59750	1000	2.80 E-6
0.6731	0.0028	60750	1000	2.80 E-6
0.6759	0.0028	61750	1000	2.80 E-6
0.6804	0.0045	62750	1000	4.48 E-6
0.6843	0.0039	63750	1000	3.92 E-6
0.6871	0.0028	64750	1000	2.80 E-6
0.6910	0.0039	65750	1000	3.92 E-6
0.6944	0.0034	66750	1000	3.36 E-6
0.6994	0.0050	67750	1000	5.04 E-6

## RUN NO. 6

0.7034	0.0011	69750	1000	1.12 E-6
0.7062	0.0028	70750	1000	2.80 E-6
0.7067	0.0006	71750	1000	5.60 E-7
0.7084	0.0017	72750	1000	1.68 E-6
0.7112	0.0028	73750	1000	2.80 E-6
0.7129	0.0017	74750	1000	1.68 E-6
0.7162	0.0034	75750	1000	3.36 E-6
0.7196	0.0034	76750	1000	3.36 E-6
0.7230	0.0034	77750	1000	3.36 E-6
0.7263	0.0034	78750	1000	3.36 E-6
0.7302	0.0039	79750	1000	3.92 E-6
0.7342	0.0039	80750	1000	3.92 E-6

TABLE 5 (continued)

## RUN NO. 7

0.7370	0.0028	81750	1000	2.80 E-6
0.7381	0.0011	82750	1000	1.12 E-6
0.7420	0.0039	83750	1000	3.92 E-6
0.7437	0.0017	84750	1000	1.68 E-6
0.7470	0.0034	85750	1000	3.36 E-6
0.7504	0.0034	86750	1000	3.36 E-6
0.7538	0.0034	87750	1000	3.36 E-6
0.7560	0.0022	88750	1000	2.24 E-6
0.7594	0.0034	89750	1000	3.36 E-6
0.7627	0.0034	90750	1000	3.36 E-6
0.7655	0.0028	91750	1000	2.80 E-6
0.7689	0.0034	92750	1000	3.36 E-6

## RUN NO. 8

0.7717	0.0028	93750	1000	2.80 E-6
0.7728	0.0011	94750	1000	1.12 E-6
0.7750	0.0022	95750	1000	2.24 E-6
0.7773	0.0022	96750	1000	2.24 E-6
0.7806	0.0034	97750	1000	3.36 E-6
0.7846	0.0039	98750	1000	3.92 E-6
0.7874	0.0028	99750	1000	2.80 E-6
0.7907	0.0034	100750	1000	3.36 E-6
0.7946	0.0039	101750	1000	3.92 E-6
0.7980	0.0034	102750	1000	3.36 E-6
0.8008	0.0028	103750	1000	2.80 E-6
0.8047	0.0039	104750	1000	3.92 E-6

## RUN NO. 9

0.8064	0.0017	105750	1000	1.68 E-6
0.8081	0.0017	106750	1000	1.68 E-6
0.8098	0.0017	107750	1000	1.68 E-6
0.8120	0.0022	108750	1000	2.24 E-6
0.8148	0.0028	109750	1000	2.80 E-6
0.8182	0.0034	110750	1000	3.36 E-6
0.8210	0.0028	111750	1000	2.80 E-6
0.8238	0.0028	112750	1000	2.80 E-6
0.8271	0.0034	113750	1000	3.36 E-6
0.8310	0.0039	114750	1000	3.92 E-6
0.8338	0.0028	115750	1000	2.80 E-6
0.8366	0.0028	116750	1000	2.80 E-6



TABLE 5 (continued)

RUN NO. 10

0.8389	0.0022	117750	1000	2.24 E-6
0.8406	0.0017	118750	1000	1.68 E-6
0.8422	0.0017	119750	1000	1.68 E-6
0.8450	0.0028	120750	1000	2.80 E-6
0.8473	0.0022	121750	1000	2.24 E-6
0.8501	0.0028	122750	1000	2.80 E-6
0.8534	0.0034	123750	1000	3.36 E-6
0.8562	0.0028	124750	1000	2.80 E-6
0.8596	0.0034	125750	1000	3.36 E-6
0.8635	0.0039	126750	1000	3.92 E-6
0.8669	0.0034	127750	1000	3.36 E-6
0.8697	0.0028	128750	1000	2.80 E-6

## . AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	2.30 E-6	0.0011	500
2	1.74 E-6	0.0032	1500
3	1.90 E-6	0.0050	2500
4	2.46 E-6	0.0072	3500
5	2.80 E-6	0.0098	4500
6	2.91 E-6	0.0127	5500
7	3.42 E-6	0.0158	6500
8	3.14 E-6	0.0191	7500
9	3.36 E-6	0.0223	8500
10	3.42 E-6	0.0257	9500
11	3.30 E-6	0.0291	10500
12	3.53 E-6	0.0325	11500

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0023	1000
2	0.0040	2000
3	0.0059	3000
4	0.0084	4000
5	0.0112	5000
6	0.0141	6000
7	0.0175	7000
8	0.0207	8000
9	0.0240	9000
10	0.0274	10000
11	0.0307	11000
12	0.0343	12000

TABLE 6

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 1-L-6, TENSION-TENSION  
 F=12Hz, K2=10, R=0.5, U=3, S=1.5

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.7207	0.0011	24000	1000	1.12 E-6
0.7213	0.0006	26000	2000	2.80 E-7
0.7218	0.0006	28000	2000	2.80 E-7
0.7235	0.0017	30000	2000	8.40 E-7
0.7252	0.0017	32000	2000	8.40 E-7
0.7269	0.0017	34000	2000	8.40 E-7
0.7291	0.0022	36000	2000	1.12 E-6
0.7314	0.0022	38000	2000	1.12 E-6
0.7342	0.0028	40000	2000	1.40 E-6
0.7364	0.0022	42000	2000	1.12 E-6
0.7386	0.0022	44000	2000	1.12 E-6
0.7414	0.0028	46000	2000	1.40 E-6
0.7442	0.0028	48000	2000	1.40 E-6
0.7465	0.0022	50000	2000	1.12 E-6
RUN NO. 2				
0.7515	0.0006	55000	1000	5.60 E-7
0.7521	0.0006	57000	2000	2.80 E-7
0.7538	0.0017	59000	2000	8.40 E-7
0.7549	0.0011	61000	2000	5.60 E-7
0.7560	0.0011	63000	2000	5.60 E-7
0.7582	0.0022	65000	2000	1.12 E-6
0.7605	0.0022	67000	2000	1.12 E-6
0.7627	0.0022	69000	2000	1.12 E-6
0.7650	0.0022	71000	2000	1.12 E-6
0.7672	0.0022	73000	2000	1.12 E-6
0.7700	0.0028	75000	2000	1.40 E-6
0.7722	0.0022	77000	2000	1.12 E-6
0.7750	0.0028	79000	2000	1.40 E-6
0.7778	0.0028	81000	2000	1.40 E-6

TABLE 6 (continued)

## RUN NO. 3

0.7784	0.0006	82000	1000	5.60 E-7
0.7790	0.0006	84000	2000	2.80 E-7
0.7795	0.0006	86000	2000	2.80 E-7
0.7806	0.0011	88000	2000	5.60 E-7
0.7818	0.0011	90000	2000	5.60 E-7
0.7840	0.0022	92000	2000	1.12 E-6
0.7868	0.0028	94000	2000	1.40 E-6
0.7896	0.0028	96000	2000	1.40 E-6
0.7913	0.0017	98000	2000	8.40 E-7
0.7935	0.0022	100000	2000	1.12 E-6
0.7952	0.0017	102000	2000	8.40 E-7
0.7980	0.0028	104000	2000	1.40 E-6
0.8002	0.0022	106000	2000	1.12 E-6
0.8030	0.0028	108000	2000	1.40 E-6

## RUN NO. 4

0.8036	0.0006	109000	1000	5.60 E-7
0.8036	0.0000	111000	2000	0.00 E+0
0.8036	0.0000	113000	2000	0.00 E+0
0.8058	0.0022	115000	2000	1.12 E-6
0.8081	0.0022	117000	2000	1.12 E-6
0.8114	0.0034	119000	2000	1.68 E-6
0.8148	0.0034	121000	2000	1.68 E-6
0.8170	0.0022	123000	2000	1.12 E-6
0.8198	0.0028	125000	2000	1.40 E-6
0.8221	0.0022	127000	2000	1.12 E-6
0.8243	0.0022	129000	2000	1.12 E-6
0.8266	0.0022	131000	2000	1.12 E-6
0.8294	0.0028	133000	2000	1.40 E-6
0.8322	0.0028	135000	2000	1.40 E-6

## RUN NO. 5

0.8350	0.0006	138000	1000	5.60 E-7
0.8361	0.0011	140000	2000	5.60 E-7
0.8366	0.0006	142000	2000	2.80 E-7
0.8383	0.0017	144000	2000	8.40 E-7
0.8394	0.0011	146000	2000	5.60 E-7
0.8417	0.0022	148000	2000	1.12 E-6
0.8445	0.0028	150000	2000	1.40 E-6
0.8467	0.0022	152000	2000	1.12 E-6
0.8490	0.0022	154000	2000	1.12 E-6
0.8518	0.0028	156000	2000	1.40 E-6
0.8546	0.0028	158000	2000	1.40 E-6
0.8568	0.0022	160000	2000	1.12 E-6
0.8590	0.0022	162000	2000	1.12 E-6
0.8613	0.0022	164000	2000	1.12 E-6

TABLE 6 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	6.72 E-7	0.0003	500
2	2.80 E-7	0.0010	2000
3	3.36 E-7	0.0016	4000
4	7.84 E-7	0.0027	6000
5	7.28 E-7	0.0042	8000
6	1.18 E-6	0.0061	10000
7	1.34 E-6	0.0086	12000
8	1.18 E-6	0.0111	14000
9	1.18 E-6	0.0135	16000
10	1.18 E-6	0.0158	18000
11	1.18 E-6	0.0182	20000
12	1.23 E-6	0.0206	22000
13	1.29 E-6	0.0231	24000
14	1.29 E-6	0.0257	26000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0007	1000
2	0.0012	3000
3	0.0019	5000
4	0.0035	7000
5	0.0049	9000
6	0.0073	11000
7	0.0100	13000
8	0.0123	15000
9	0.0147	17000
10	0.0170	19000
11	0.0194	21000
12	0.0218	23000
13	0.0244	25000
14	0.0270	27000

TABLE 7  
EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
TEMPERATURE DESICCATED AIR  
SPECIMEN NO. 1-L-2, TENSION-TENSION  
F=12Hz, K2=10, R=0.5, U=6, S=1.5

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.2471	0.0011	51500	1000	1.12 E-6
1.2482	0.0011	53500	2000	5.60 E-7
1.2499	0.0017	55500	2000	8.40 E-7
1.2527	0.0028	57500	2000	1.40 E-6
1.2544	0.0017	59500	2000	8.40 E-7
1.2561	0.0017	61500	2000	8.40 E-7
1.2583	0.0022	63500	2000	1.12 E-6
1.2611	0.0028	65500	2000	1.40 E-6
1.2634	0.0022	67500	2000	1.12 E-6
1.2650	0.0017	69500	2000	8.40 E-7
1.2684	0.0034	71500	2000	1.68 E-6
1.2706	0.0022	73500	2000	1.12 E-6
1.2746	0.0039	75500	2000	1.96 E-6
RUN NO. 2				
1.2762	0.0017	76500	1000	1.68 E-6
1.2779	0.0017	78500	2000	8.40 E-7
1.2802	0.0022	80500	2000	1.12 E-6
1.2818	0.0017	82500	2000	8.40 E-7
1.2824	0.0006	84500	2000	2.80 E-7
1.2841	0.0017	86500	2000	8.40 E-7
1.2852	0.0011	88500	2000	5.60 E-7
1.2880	0.0028	90500	2000	1.40 E-6
1.2908	0.0028	92500	2000	1.40 E-6
1.2930	0.0022	94500	2000	1.12 E-6
1.2953	0.0022	96500	2000	1.12 E-6
1.2981	0.0028	98500	2000	1.40 E-6
1.3009	0.0028	100500	2000	1.40 E-6
RUN NO. 3				
1.3048	0.0011	103500	1000	1.12 E-6
1.3054	0.0006	105500	2000	2.80 E-7
1.3065	0.0011	107500	2000	5.60 E-7
1.3087	0.0022	109500	2000	1.12 E-6
1.3104	0.0017	111500	2000	8.40 E-7
1.3121	0.0017	113500	2000	8.40 E-7
1.3149	0.0028	115500	2000	1.40 E-6
1.3171	0.0022	117500	2000	1.12 E-6
1.3194	0.0022	119500	2000	1.12 E-6
1.3222	0.0028	121500	2000	1.40 E-6
1.3250	0.0028	123500	2000	1.40 E-6
1.3278	0.0028	125500	2000	1.40 E-6
1.3300	0.0022 (48)	127500	2000	1.12 E-6

TABLE 7 (continued)

## RUN NO. 4

1.3334	0.0011	130500	1000	1.12 E-6
1.3339	0.0006	132500	2000	2.80 E-7
1.3356	0.0017	134500	2000	8.40 E-7
1.3367	0.0011	136500	2000	5.60 E-7
1.3384	0.0017	138500	2000	8.40 E-7
1.3401	0.0017	140500	2000	8.40 E-7
1.3429	0.0028	142500	2000	1.40 E-6
1.3457	0.0028	144500	2000	1.40 E-6
1.3474	0.0017	146500	2000	8.40 E-7
1.3496	0.0022	148500	2000	1.12 E-6
1.3518	0.0022	150500	2000	1.12 E-6
1.3541	0.0022	152500	2000	1.12 E-6
1.3563	0.0022	154500	2000	1.12 E-6

## RUN NO. 5

1.3569	0.0006	155500	1000	5.60 E-7
1.3580	0.0011	157500	2000	5.60 E-7
1.3591	0.0011	159500	2000	5.60 E-7
1.3602	0.0011	161500	2000	5.60 E-7
1.3619	0.0017	163500	2000	8.40 E-7
1.3642	0.0022	165500	2000	1.12 E-6
1.3658	0.0017	167500	2000	8.40 E-7
1.3681	0.0022	169500	2000	1.12 E-6
1.3703	0.0022	171500	2000	1.12 E-6
1.3731	0.0028	173500	2000	1.40 E-6
1.3754	0.0022	175500	2000	1.12 E-6
1.3776	0.0022	177500	2000	1.12 E-6
1.3804	0.0028	179500	2000	1.40 E-6

## RUN NO. 6

1.3810	0.0006	180500	1000	5.60 E-7
1.3821	0.0011	182500	2000	5.60 E-7
1.3838	0.0017	184500	2000	8.40 E-7
1.3860	0.0022	186500	2000	1.12 E-6
1.3871	0.0011	188500	2000	5.60 E-7
1.3894	0.0022	190500	2000	1.12 E-6
1.3927	0.0034	192500	2000	1.68 E-6
1.3955	0.0028	194500	2000	1.40 E-6
1.3972	0.0017	196500	2000	8.40 E-7
1.3994	0.0022	198500	2000	1.12 E-6
1.4017	0.0022	200500	2000	1.12 E-6
1.4039	0.0022	202500	2000	1.12 E-6
1.4062	0.0022	204500	2000	1.12 E-6

TABLE 7 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	1.03 E-6	0.0005	500
2	5.13 E-7	0.0015	2000
3	7.93 E-7	0.0028	4000
4	9.33 E-7	0.0046	6000
5	7.00 E-7	0.0062	8000
6	9.33 E-7	0.0078	10000
7	1.17 E-6	0.0099	12000
8	1.31 E-6	0.0124	14000
9	1.07 E-6	0.0148	16000
10	1.17 E-6	0.0170	18000
11	1.26 E-6	0.0195	20000
12	1.21 E-6	0.0219	22000
13	1.35 E-6	0.0245	24000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0010	1000
2	0.0021	3000
3	0.0036	5000
4	0.0055	7000
5	0.0069	9000
6	0.0088	11000
7	0.0111	13000
8	0.0137	15000
9	0.0159	17000
10	0.0182	19000
11	0.0207	21000
12	0.0231	23000
13	0.0259	25000

TABLE 8  
EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
TEMPERATURE DESICCATED AIR  
SPECIMEN NO. 3-L-13, TENSION-TENSION  
F=12Hz, K2=10, R=0.1, U=20, S=2.0

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.9274	0.0045	27000	1000	4.48 E-6
0.9307	0.0034	29000	2000	1.68 E-6
0.9313	0.0006	31000	2000	2.80 E-7
0.9346	0.0034	33000	2000	1.68 E-6
0.9391	0.0045	35000	2000	2.24 E-6
0.9447	0.0056	37000	2000	2.80 E-6
0.9526	0.0078	39000	2000	3.92 E-6
0.9615	0.0090	41000	2000	4.48 E-6
0.9727	0.0112	43000	2000	5.60 E-6
0.9839	0.0112	45000	2000	5.60 E-6
0.9957	0.0118	47000	2000	5.88 E-6
1.0058	0.0101	49000	2000	5.04 E-6
RUN NO. 2				
1.0102	0.0045	50000	1000	4.48 E-6
1.0136	0.0034	52000	2000	1.68 E-6
1.0164	0.0028	54000	2000	1.40 E-6
1.0192	0.0028	56000	2000	1.40 E-6
1.0242	0.0050	58000	2000	2.52 E-6
1.0310	0.0067	60000	2000	3.36 E-6
1.0399	0.0090	62000	2000	4.48 E-6
1.0494	0.0095	64000	2000	4.76 E-6
1.0606	0.0112	66000	2000	5.60 E-6
1.0724	0.0118	68000	2000	5.88 E-6
1.0830	0.0106	70000	2000	5.32 E-6
1.0948	0.0118	72000	2000	5.88 E-6
RUN NO. 3				
1.0998	0.0050	73000	1000	5.04 E-6
1.1026	0.0028	75000	2000	1.40 E-6
1.1043	0.0017	77000	2000	8.40 E-7
1.1071	0.0028	79000	2000	1.40 E-6
1.1127	0.0056	81000	2000	2.80 E-6
1.1200	0.0073	83000	2000	3.64 E-6
1.1295	0.0095	85000	2000	4.76 E-6
1.1379	0.0084	87000	2000	4.20 E-6
1.1486	0.0106	89000	2000	5.32 E-6
1.1586	0.0101	91000	2000	5.04 E-6
1.1698	0.0112	93000	2000	5.60 E-6
1.1827	0.0129	95000	2000	6.44 E-6



TABLE 8 (continued)

RUN NO. 4

1.1883	0.0056	96000	1000	5.60 E-6
1.1911	0.0028	98000	2000	1.40 E-6
1.1945	0.0034	100000	2000	1.68 E-6
1.1984	0.0039	102000	2000	1.96 E-6
1.2046	0.0062	104000	2000	3.08 E-6
1.2135	0.0090	106000	2000	4.48 E-6
1.2214	0.0078	108000	2000	3.92 E-6
1.2314	0.0101	110000	2000	5.04 E-6
1.2449	0.0134	112000	2000	6.72 E-6
1.2578	0.0129	114000	2000	6.44 E-6
1.2701	0.0123	116000	2000	6.16 E-6
1.2830	0.0129	118000	2000	6.44 E-6

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	4.90 E-6	0.0025	500
2	1.54 E-6	0.0064	2000
3	1.05 E-6	0.0090	4000
4	1.61 E-6	0.0117	6000
5	2.66 E-6	0.0160	8000
6	3.57 E-6	0.0222	10000
7	4.27 E-6	0.0300	12000
8	4.62 E-6	0.0389	14000
9	5.81 E-6	0.0494	16000
10	5.74 E-6	0.0609	18000
11	5.74 E-6	0.0724	20000
12	5.95 E-6	0.0841	22000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0049	1000
2	0.0080	3000
3	0.0101	5000
4	0.0133	7000
5	0.0186	9000
6	0.0258	11000
7	0.0343	13000
8	0.0435	15000
9	0.0552	17000
10	0.0666	19000
11	0.0781	21000
12	0.0900	23000

TABLE 9  
EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
TEMPERATURE DESICCATED AIR  
SPECIMEN NO. 1-L-6, TENSION-TENSION  
F=12Hz, K2=10, R=0.5, U=4, S=2.0

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.8977	0.0011	58000	1000	1.12 E-6
0.8988	0.0011	66000	8000	1.40 E-7
0.8988	0.0000	74000	8000	0.00 E+0
0.8988	0.0000	82000	8000	0.00 E+0
0.8994	0.0006	90000	8000	7.00 E-8
0.8994	0.0000	94000	4000	0.00 E+0
0.9005	0.0011	98000	4000	2.80 E-7
0.9010	0.0006	102000	4000	1.40 E-7
0.9016	0.0006	104000	2000	2.80 E-7
0.9022	0.0006	106000	2000	2.80 E-7
0.9027	0.0006	108000	2000	2.80 E-7
0.9038	0.0011	110000	2000	5.60 E-7
0.9055	0.0017	112000	2000	8.40 E-7
0.9089	0.0034	114000	2000	1.68 E-6
0.9122	0.0034	116000	2000	1.68 E-6
0.9150	0.0028	118000	2000	1.40 E-6
0.9178	0.0028	120000	2000	1.40 E-6
0.9206	0.0028	122000	2000	1.40 E-6
0.9246	0.0039	124000	2000	1.96 E-6
RUN NO. 2				
0.9290	0.0017	127000	1000	1.68 E-6
0.9296	0.0006	135000	8000	7.00 E-8
0.9296	0.0000	143000	8000	0.00 E+0
0.9296	0.0000	151000	8000	0.00 E+0
0.9302	0.0006	159000	8000	7.00 E-8
0.9318	0.0017	163000	4000	4.20 E-7
0.9330	0.0011	167000	4000	2.80 E-7
0.9346	0.0017	171000	4000	4.20 E-7
0.9358	0.0011	173000	2000	5.60 E-7
0.9369	0.0011	175000	2000	5.60 E-7
0.9380	0.0011	177000	2000	5.60 E-7
0.9391	0.0011	179000	2000	5.60 E-7
0.9414	0.0022	181000	2000	1.12 E-6
0.9430	0.0017	183000	2000	8.40 E-7
0.9447	0.0017	185000	2000	8.40 E-7
0.9481	0.0034	187000	2000	1.68 E-6
0.9509	0.0028	189000	2000	1.40 E-6
0.9526	0.0017	191000	2000	8.40 E-7
0.9554	0.0028	193000	2000	1.40 E-6

TABLE 9 (continued)

RUN NO. 3

0.9565	0.0011	194000	1000	1.12 E-6
0.9570	0.0006	202000	8000	7.00 E-8
0.9576	0.0006	210000	8000	7.00 E-8
0.9576	0.0000	218000	8000	0.00 E+0
0.9576	0.0000	226000	8000	0.00 E+0
0.9582	0.0006	230000	4000	1.40 E-7
0.9587	0.0006	234000	4000	1.40 E-7
0.9587	0.0000	238000	4000	0.00 E+0
0.9587	0.0000	240000	2000	0.00 E+0
0.9593	0.0006	242000	2000	2.80 E-7
0.9598	0.0006	244000	2000	2.80 E-7
0.9604	0.0006	246000	2000	2.80 E-7
0.9615	0.0011	248000	2000	5.60 E-7
0.9626	0.0011	250000	2000	5.60 E-7
0.9643	0.0017	252000	2000	8.40 E-7
0.9671	0.0028	254000	2000	1.40 E-6
0.9699	0.0028	256000	2000	1.40 E-6
0.9722	0.0022	258000	2000	1.12 E-6
0.9750	0.0028	260000	2000	1.40 E-6

TABLE 9 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	1.31 E-6	0.0007	500
2	9.33 E-8	0.0017	5000
3	2.33 E-8	0.0021	13000
4	0.00 E+0	0.0022	21000
5	4.67 E-8	0.0024	29000
6	1.87 E-7	0.0030	35000
7	2.33 E-7	0.0038	39000
8	1.87 E-7	0.0047	43000
9	2.80 E-7	0.0053	46000
10	3.73 E-7	0.0060	48000
11	3.73 E-7	0.0067	50000
12	4.67 E-7	0.0076	52000
13	8.40 E-7	0.0089	54000
14	1.03 E-6	0.0107	56000
15	1.12 E-6	0.0129	58000
16	1.49 E-6	0.0155	60000
17	1.40 E-6	0.0184	62000
18	1.12 E-6	0.0209	64000
19	1.59 E-6	0.0236	66000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0013	1000
2	0.0020	9000
3	0.0022	17000
4	0.0022	25000
5	0.0026	33000
6	0.0034	37000
7	0.0043	41000
8	0.0051	45000
9	0.0056	47000
10	0.0064	49000
11	0.0071	51000
12	0.0080	53000
13	0.0097	55000
14	0.0118	57000
15	0.0140	59000
16	0.0170	61000
17	0.0198	63000
18	0.0220	65000
19	0.0252	67000

TABLE 10  
EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
TEMPERATURE DESICCATED AIR  
SPECIMEN NO. 1-L-2, TENSION-TENSION  
F=12Hz, K2=10, R=0.5, U=8 S=2.0

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.4454	0.0011	18500	1000	1.12 E-6
1.4465	0.0011	22500	4000	2.80 E-7
1.4470	0.0006	26500	4000	1.40 E-7
1.4482	0.0011	30500	4000	2.80 E-7
1.4487	0.0006	34500	4000	1.40 E-7
1.4487	0.0000	38500	4000	0.00 E+0
1.4504	0.0017	42500	4000	4.20 E-7
1.4538	0.0034	46500	4000	8.40 E-7
1.4554	0.0017	48500	2000	8.40 E-7
1.4571	0.0017	50500	2000	8.40 E-7
1.4594	0.0022	52500	2000	1.12 E-6
1.4627	0.0034	54500	2000	1.68 E-6
1.4655	0.0028	56500	2000	1.40 E-6
1.4678	0.0022	58500	2000	1.12 E-6
1.4706	0.0028	60500	2000	1.40 E-6
RUN NO. 2				
1.5047	0.0017	108500	1000	1.68 E-6
1.5058	0.0011	112500	4000	2.80 E-7
1.5064	0.0006	116500	4000	1.40 E-7
1.5070	0.0006	120500	4000	1.40 E-7
1.5081	0.0011	124500	4000	2.80 E-7
1.5086	0.0006	128500	4000	1.40 E-7
1.5092	0.0006	132500	4000	1.40 E-7
1.5114	0.0022	136500	4000	5.60 E-7
1.5131	0.0017	138500	2000	8.40 E-7
1.5148	0.0017	140500	2000	8.40 E-7
1.5165	0.0017	142500	2000	8.40 E-7
1.5182	0.0017	144500	2000	8.40 E-7
1.5198	0.0017	146500	2000	8.40 E-7
1.5215	0.0017	148500	2000	8.40 E-7
1.5232	0.0017	150500	2000	8.40 E-7

TABLE 10 (continued)

## RUN NO. 3

1.5322	0.0017	157500	1000	1.68 E-6
1.5327	0.0006	161500	4000	1.40 E-7
1.5327	0.0000	165500	4000	0.00 E+0
1.5333	0.0006	169500	4000	1.40 E-7
1.5344	0.0011	173500	4000	2.80 E-7
1.5350	0.0006	177500	4000	1.40 E-7
1.5361	0.0011	181500	4000	2.80 E-7
1.5372	0.0011	185500	4000	2.80 E-7
1.5394	0.0022	187500	2000	1.12 E-6
1.5411	0.0017	189500	2000	8.40 E-7
1.5434	0.0022	191500	2000	1.12 E-6
1.5456	0.0022	193500	2000	1.12 E-6
1.5484	0.0028	195500	2000	1.40 E-6
1.5518	0.0034	197500	2000	1.68 E-6
1.5551	0.0034	199500	2000	1.68 E-6

## RUN NO. 4

1.5590	0.0017	202500	1000	1.68 E-6
1.5596	0.0006	206500	4000	1.40 E-7
1.5607	0.0011	210500	4000	2.80 E-7
1.5613	0.0006	214500	4000	1.40 E-7
1.5624	0.0011	218500	4000	2.80 E-7
1.5635	0.0011	222500	4000	2.80 E-7
1.5646	0.0011	226500	4000	2.80 E-7
1.5680	0.0034	230500	4000	8.40 E-7
1.5702	0.0022	232500	2000	1.12 E-6
1.5719	0.0017	234500	2000	8.40 E-7
1.5747	0.0028	236500	2000	1.40 E-6
1.5764	0.0017	238500	2000	8.40 E-7
1.5786	0.0022	240500	2000	1.12 E-6
1.5803	0.0017	242500	2000	8.40 E-7
1.5831	0.0028	244500	2000	1.40 E-6

## RUN NO. 5

1.5882	0.0011	247500	1000	1.12 E-6
1.5893	0.0011	251500	4000	2.80 E-7
1.5904	0.0011	255500	4000	2.80 E-7
1.5910	0.0006	259500	4000	1.40 E-7
1.5915	0.0006	263500	4000	1.40 E-7
1.5921	0.0006	267500	4000	1.40 E-7
1.5938	0.0017	271500	4000	4.20 E-7
1.5971	0.0034	275500	4000	8.40 E-7
1.5988	0.0017	277500	2000	8.40 E-7
1.6005	0.0017	279500	2000	8.40 E-7
1.6033	0.0028	281500	2000	1.40 E-6
1.6050	0.0017	283500	2000	8.40 E-7
1.6066	0.0017	285500	2000	8.40 E-7
1.6089	0.0022	287500	2000	1.12 E-6
1.6111	0.0022	289500	2000	1.12 E-6

TABLE 10 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	1.46 E-6	0.0007	500
2	2.24 E-7	0.0019	3000
3	1.68 E-7	0.0027	7000
4	1.68 E-7	0.0034	11000
5	2.24 E-7	0.0041	15000
6	1.40 E-7	0.0049	19000
7	3.08 E-7	0.0058	23000
8	6.72 E-7	0.0077	27000
9	9.52 E-7	0.0100	30000
10	8.40 E-7	0.0118	32000
11	1.18 E-6	0.0138	34000
12	1.06 E-6	0.0161	36000
13	1.12 E-6	0.0183	38000
14	1.12 E-6	0.0205	40000
15	1.29 E-6	0.0229	42000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0015	1000
2	0.0024	5000
3	0.0030	9000
4	0.0037	13000
5	0.0046	17000
6	0.0052	21000
7	0.0064	25000
8	0.0091	29000
9	0.0110	31000
10	0.0127	33000
11	0.0150	35000
12	0.0171	37000
13	0.0194	39000
14	0.0216	41000
15	0.0242	43000

TABLE 11

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 1-L-10, TENSION-TENSION  
 F=12Hz, K2=10, R=0.3, U=6.67, S=2.0

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.9962	0.0039	14500	2000	1.96 E-6
0.9968	0.0006	16500	2000	2.80 E-7
0.9974	0.0006	18500	2000	2.80 E-7
0.9974	0.0000	20500	2000	0.00 E+0
0.9979	0.0006	22500	2000	2.80 E-7
0.9990	0.0011	24500	2000	5.60 E-7
0.9996	0.0006	26500	2000	2.80 E-7
1.0030	0.0034	28500	2000	1.68 E-6
1.0052	0.0022	30500	2000	1.12 E-6
1.0097	0.0045	32500	2000	2.24 E-6
1.0147	0.0050	34500	2000	2.52 E-6
1.0209	0.0062	36500	2000	3.08 E-6
1.0304	0.0095	38500	2000	4.76 E-6
1.0349	0.0045	40500	2000	2.24 E-6
1.0422	0.0073	42500	2000	3.64 E-6
RUN NO. 2				
1.0438	0.0017	44500	2000	8.40 E-7
1.0444	0.0006	46500	2000	2.80 E-7
1.0455	0.0011	48500	2000	5.60 E-7
1.0461	0.0006	50500	2000	2.80 E-7
1.0461	0.0000	52500	2000	0.00 E+0
1.0478	0.0017	54500	2000	8.40 E-7
1.0506	0.0028	56500	2000	1.40 E-6
1.0522	0.0017	58500	2000	8.40 E-7
1.0545	0.0022	60500	2000	1.12 E-6
1.0590	0.0045	62500	2000	2.24 E-6
1.0651	0.0062	64500	2000	3.08 E-6
1.0702	0.0050	66500	2000	2.52 E-6
1.0763	0.0062	68500	2000	3.08 E-6
1.0830	0.0067	70500	2000	3.36 E-6
1.0892	0.0062	72500	2000	3.08 E-6



TABLE 11 (continued)

## RUN NO. 3

1.0937	0.0045	74500	2000	2.24 E-6
1.0948	0.0011	76500	2000	5.60 E-7
1.0954	0.0006	78500	2000	2.80 E-7
1.0959	0.0006	80500	2000	2.80 E-7
1.0965	0.0006	82500	2000	2.80 E-7
1.0976	0.0011	84500	2000	5.60 E-7
1.0987	0.0011	86500	2000	5.60 E-7
1.1004	0.0017	88500	2000	8.40 E-7
1.1021	0.0017	90500	2000	8.40 E-7
1.1071	0.0050	92500	2000	2.52 E-6
1.1122	0.0050	94500	2000	2.52 E-6
1.1183	0.0062	96500	2000	3.08 E-6
1.1250	0.0067	98500	2000	3.36 E-6
1.1312	0.0062	100500	2000	3.08 E-6
1.1390	0.0078	102500	2000	3.92 E-6

## RUN NO. 4

1.1418	0.0028	104500	2000	1.40 E-6
1.1446	0.0028	106500	2000	1.40 E-6
1.1458	0.0011	108500	2000	5.60 E-7
1.1458	0.0000	110500	2000	0.00 E+0
1.1463	0.0006	112500	2000	2.80 E-7
1.1480	0.0017	114500	2000	8.40 E-7
1.1491	0.0011	116500	2000	5.60 E-7
1.1508	0.0017	118500	2000	8.40 E-7
1.1536	0.0028	120500	2000	1.40 E-6
1.1586	0.0050	122500	2000	2.52 E-6
1.1648	0.0062	124500	2000	3.08 E-6
1.1721	0.0073	126500	2000	3.64 E-6
1.1777	0.0056	128500	2000	2.80 E-6
1.1855	0.0078	130500	2000	3.92 E-6
1.1922	0.0067	132500	2000	3.36 E-6

## RUN NO. 5

1.2023	0.0034	136500	2000	1.68 E-6
1.2029	0.0006	138500	2000	2.80 E-7
1.2040	0.0011	140500	2000	5.60 E-7
1.2062	0.0022	142500	2000	1.12 E-6
1.2074	0.0011	144500	2000	5.60 E-7
1.2085	0.0011	146500	2000	5.60 E-7
1.2096	0.0011	148500	2000	5.60 E-7
1.2124	0.0028	150500	2000	1.40 E-6
1.2163	0.0039	152500	2000	1.96 E-6
1.2208	0.0045	154500	2000	2.24 E-6
1.2270	0.0062	156500	2000	3.08 E-6
1.2326	0.0056	158500	2000	2.80 E-6
1.2398	0.0073	160500	2000	3.64 E-6
1.2466	0.0067	162500	2000	3.36 E-6
1.2527	0.0062	164500	2000	3.08 E-6

TABLE 11 (continued)

## RUN NO. 6

1.2572	0.0045	166500	2000	2.24 E-6
1.2578	0.0006	168500	2000	2.80 E-7
1.2578	0.0000	170500	2000	0.00 E+0
1.2589	0.0011	172500	2000	5.60 E-7
1.2589	0.0000	174500	2000	0.00 E+0
1.2611	0.0022	176500	2000	1.12 E-6
1.2634	0.0022	178500	2000	1.12 E-6
1.2645	0.0011	180500	2000	5.60 E-7
1.2678	0.0034	182500	2000	1.68 E-6
1.2718	0.0039	184500	2000	1.96 E-6
1.2802	0.0084	186500	2000	4.20 E-6
1.2846	0.0045	188500	2000	2.24 E-6
1.2914	0.0067	190500	2000	3.36 E-6
1.2975	0.0062	192500	2000	3.08 E-6
1.3037	0.0062	194500	2000	3.08 E-6

## RUN NO. 7

1.3076	0.0039	196500	2000	1.96 E-6
1.3093	0.0017	198500	2000	8.40 E-7
1.3104	0.0011	200500	2000	5.60 E-7
1.3110	0.0006	202500	2000	2.80 E-7
1.3121	0.0011	204500	2000	5.60 E-7
1.3138	0.0017	206500	2000	8.40 E-7
1.3143	0.0006	208500	2000	2.80 E-7
1.3160	0.0017	210500	2000	8.40 E-7
1.3188	0.0028	212500	2000	1.40 E-6
1.3222	0.0034	214500	2000	1.68 E-6
1.3283	0.0062	216500	2000	3.08 E-6
1.3367	0.0084	218500	2000	4.20 E-6
1.3412	0.0045	220500	2000	2.24 E-6
1.3474	0.0062	222500	2000	3.08 E-6
1.3541	0.0067	224500	2000	3.36 E-6

## RUN NO. 8

1.3586	0.0045	226500	2000	2.24 E-6
1.3591	0.0006	228500	2000	2.80 E-7
1.3591	0.0000	230500	2000	0.00 E+0
1.3597	0.0006	232500	2000	2.80 E-7
1.3602	0.0006	234500	2000	2.80 E-7
1.3619	0.0017	236500	2000	8.40 E-7
1.3630	0.0011	238500	2000	5.60 E-7
1.3653	0.0022	240500	2000	1.12 E-6
1.3681	0.0028	242500	2000	1.40 E-6
1.3731	0.0050	244500	2000	2.52 E-6
1.3798	0.0067	246500	2000	3.36 E-6
1.3882	0.0084	248500	2000	4.20 E-6
1.3955	0.0073	250500	2000	3.64 E-6
1.4028	0.0073	252500	2000	3.64 E-6
1.4106	0.0078	254500	2000	3.92 E-6

(61)

TABLE 11 (continued)

RUN NO. 9

1.4230	0.0045	258500	2000	2.24 E-6
1.4235	0.0006	260500	2000	2.80 E-7
1.4235	0.0000	262500	2000	0.00 E+0
1.4246	0.0011	264500	2000	5.60 E-7
1.4258	0.0011	266500	2000	5.60 E-7
1.4263	0.0006	268500	2000	2.80 E-7
1.4274	0.0011	270500	2000	5.60 E-7
1.4297	0.0022	272500	2000	1.12 E-6
1.4330	0.0034	274500	2000	1.68 E-6
1.4398	0.0067	276500	2000	3.36 E-6
1.4448	0.0050	278500	2000	2.52 E-6
1.4515	0.0067	280500	2000	3.36 E-6
1.4582	0.0067	282500	2000	3.36 E-6
1.4655	0.0073	284500	2000	3.64 E-6
1.4734	0.0078	286500	2000	3.92 E-6

RUN NO. 10

1.4818	0.0022	290500	2000	1.12 E-6
1.4829	0.0011	292500	2000	5.60 E-7
1.4829	0.0000	294500	2000	0.00 E+0
1.4834	0.0006	296500	2000	2.80 E-7
1.4834	0.0000	298500	2000	0.00 E+0
1.4840	0.0006	300500	2000	2.80 E-7
1.4857	0.0017	302500	2000	8.40 E-7
1.4874	0.0017	304500	2000	8.40 E-7
1.4902	0.0028	306500	2000	1.40 E-6
1.4946	0.0045	308500	2000	2.24 E-6
1.4986	0.0039	310500	2000	1.96 E-6
1.5047	0.0062	312500	2000	3.08 E-6
1.5109	0.0062	314500	2000	3.08 E-6
1.5176	0.0067	316500	2000	3.36 E-6
1.5238	0.0062	318500	2000	3.08 E-6

TABLE 11 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	1.79 E-6	0.0018	1000
2	5.04 E-7	0.0041	3000
3	2.80 E-7	0.0049	5000
4	3.64 E-7	0.0055	7000
5	2.80 E-7	0.0062	9000
6	6.72 E-7	0.0071	11000
7	6.72 E-7	0.0085	13000
8	1.01 E-6	0.0101	15000
9	1.40 E-6	0.0125	17000
10	2.35 E-6	0.0163	19000
11	2.94 E-6	0.0216	21000
12	3.22 E-6	0.0277	23000
13	3.33 E-6	0.0343	25000
14	3.28 E-6	0.0409	27000
15	3.44 E-6	0.0476	29000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0036	2000
2	0.0046	4000
3	0.0052	6000
4	0.0059	8000
5	0.0064	10000
6	0.0078	12000
7	0.0091	14000
8	0.0111	16000
9	0.0139	18000
10	0.0186	20000
11	0.0245	22000
12	0.0310	24000
13	0.0376	26000
14	0.0442	28000
15	0.0511	30000

TABLE 12

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 1-L-18, TENSION-TENSION  
 F=12Hz, K2=10, R=0.3, U=13.33, S=2.0

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.1984	0.0039	20500	2000	1.96 E-6
1.1990	0.0006	22500	2000	2.80 E-7
1.2001	0.0011	24500	2000	5.60 E-7
1.2018	0.0017	26500	2000	8.40 E-7
1.2018	0.0000	28500	2000	0.00 E+0
1.2051	0.0034	30500	2000	1.68 E-6
1.2079	0.0028	32500	2000	1.40 E-6
1.2130	0.0050	34500	2000	2.52 E-6
1.2169	0.0039	36500	2000	1.96 E-6
1.2225	0.0056	38500	2000	2.80 E-6
1.2275	0.0050	40500	2000	2.52 E-6
1.2342	0.0067	42500	2000	3.36 E-6
1.2415	0.0073	44500	2000	3.64 E-6
RUN NO. 2				
1.2874	0.0028	71500	2000	1.40 E-6
1.2886	0.0011	73500	2000	5.60 E-7
1.2897	0.0011	75500	2000	5.60 E-7
1.2902	0.0006	77500	2000	2.80 E-7
1.2914	0.0011	79500	2000	5.60 E-7
1.2930	0.0017	81500	2000	8.40 E-7
1.2947	0.0017	83500	2000	8.40 E-7
1.2981	0.0034	85500	2000	1.68 E-6
1.3020	0.0039	87500	2000	1.96 E-6
1.3076	0.0056	89500	2000	2.80 E-6
1.3143	0.0067	91500	2000	3.36 E-6
1.3216	0.0073	93500	2000	3.64 E-6
1.3283	0.0067	95500	2000	3.36 E-6
RUN NO. 3				
1.3311	0.0028	97500	2000	1.40 E-6
1.3317	0.0006	99500	2000	2.80 E-7
1.3322	0.0006	101500	2000	2.80 E-7
1.3339	0.0017	103500	2000	8.40 E-7
1.3356	0.0017	105500	2000	8.40 E-7
1.3401	0.0045	107500	2000	2.24 E-6
1.3434	0.0034	109500	2000	1.68 E-6
1.3502	0.0067	111500	2000	3.36 E-6
1.3541	0.0039	113500	2000	1.96 E-6
1.3586	0.0045	115500	2000	2.24 E-6
1.3642	0.0056	117500	2000	2.80 E-6
1.3698	0.0056	119500	2000	2.80 E-6
1.3765	0.0067	(64) 121500	2000	3.36 E-6

TABLE 12 (continued)

## RUN NO. 4

1.3804	0.0039	123500	2000	1.96 E-6
1.3810	0.0006	125500	2000	2.80 E-7
1.3815	0.0006	127500	2000	2.80 E-7
1.3832	0.0017	129500	2000	8.40 E-7
1.3843	0.0011	131500	2000	5.60 E-7
1.3854	0.0011	133500	2000	5.60 E-7
1.3877	0.0022	135500	2000	1.12 E-6
1.3905	0.0028	137500	2000	1.40 E-6
1.3938	0.0034	139500	2000	1.68 E-6
1.3989	0.0050	141500	2000	2.52 E-6
1.4056	0.0067	143500	2000	3.36 E-6
1.4118	0.0062	145500	2000	3.08 E-6
1.4174	0.0056	147500	2000	2.80 E-6

## RUN NO. 5

1.4207	0.0034	149500	2000	1.68 E-6
1.4213	0.0006	151500	2000	2.80 E-7
1.4224	0.0011	153500	2000	5.60 E-7
1.4230	0.0006	155500	2000	2.80 E-7
1.4258	0.0028	157500	2000	1.40 E-6
1.4280	0.0022	159500	2000	1.12 E-6
1.4297	0.0017	161500	2000	8.40 E-7
1.4336	0.0039	163500	2000	1.96 E-6
1.4381	0.0045	165500	2000	2.24 E-6
1.4437	0.0056	167500	2000	2.80 E-6
1.4487	0.0050	169500	2000	2.52 E-6
1.4549	0.0062	171500	2000	3.08 E-6
1.4633	0.0084	173500	2000	4.20 E-6

## RUN NO. 6

1.4706	0.0028	177500	2000	1.40 E-6
1.4722	0.0017	179500	2000	8.40 E-7
1.4734	0.0011	181500	2000	5.60 E-7
1.4750	0.0017	183500	2000	8.40 E-7
1.4762	0.0011	185500	2000	5.60 E-7
1.4790	0.0028	187500	2000	1.40 E-6
1.4818	0.0028	189500	2000	1.40 E-6
1.4851	0.0034	191500	2000	1.68 E-6
1.4890	0.0039	193500	2000	1.96 E-6
1.4946	0.0056	195500	2000	2.80 E-6
1.5002	0.0056	197500	2000	2.80 E-6
1.5058	0.0056	199500	2000	2.80 E-6
1.5126	0.0067	201500	2000	3.36 E-6

TABLE 12 (continued)

## RUN NO. 7

1.5165	0.0039	203500	2000	1.96 E-6
1.5176	0.0011	205500	2000	5.60 E-7
1.5182	0.0006	207500	2000	2.80 E-7
1.5193	0.0011	209500	2000	5.60 E-7
1.5204	0.0011	211500	2000	5.60 E-7
1.5221	0.0017	213500	2000	8.40 E-7
1.5249	0.0028	215500	2000	1.40 E-6
1.5282	0.0034	217500	2000	1.68 E-6
1.5333	0.0050	219500	2000	2.52 E-6
1.5389	0.0056	221500	2000	2.80 E-6
1.5422	0.0034	223500	2000	1.68 E-6
1.5490	0.0067	225500	2000	3.36 E-6
1.5557	0.0067	227500	2000	3.36 E-6

## RUN NO. 8

1.5590	0.0034	229500	2000	1.68 E-6
1.5602	0.0011	231500	2000	5.60 E-7
1.5618	0.0017	233500	2000	8.40 E-7
1.5635	0.0017	235500	2000	8.40 E-7
1.5658	0.0022	237500	2000	1.12 E-6
1.5680	0.0022	239500	2000	1.12 E-6
1.5691	0.0011	241500	2000	5.60 E-7
1.5730	0.0039	243500	2000	1.96 E-6
1.5775	0.0045	245500	2000	2.24 E-6
1.5826	0.0050	247500	2000	2.52 E-6
1.5870	0.0045	249500	2000	2.24 E-6
1.5926	0.0056	251500	2000	2.80 E-6
1.5994	0.0067	253500	2000	3.36 E-6

## RUN NO. 9

1.6022	0.0028	255500	2000	1.40 E-6
1.6038	0.0017	257500	2000	8.40 E-7
1.6050	0.0011	259500	2000	5.60 E-7
1.6061	0.0011	261500	2000	5.60 E-7
1.6089	0.0028	263500	2000	1.40 E-6
1.6111	0.0022	265500	2000	1.12 E-6
1.6145	0.0034	267500	2000	1.68 E-6
1.6184	0.0039	269500	2000	1.96 E-6
1.6229	0.0045	271500	2000	2.24 E-6
1.6285	0.0056	273500	2000	2.80 E-6
1.6324	0.0039	275500	2000	1.96 E-6
1.6380	0.0056	277500	2000	2.80 E-6
1.6447	0.0067	279500	2000	3.36 E-6

TABLE 12 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	1.65 E-6	0.0016	1000
2	4.98 E-7	0.0038	3000
3	4.98 E-7	0.0048	5000
4	6.53 E-7	0.0059	7000
5	7.78 E-7	0.0074	9000
6	1.21 E-6	0.0094	11000
7	1.21 E-6	0.0118	13000
8	2.02 E-6	0.0150	15000
9	2.08 E-6	0.0191	17000
10	2.68 E-6	0.0239	19000
11	2.58 E-6	0.0292	21000
12	3.08 E-6	0.0348	23000
13	3.42 E-6	0.0413	25000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0033	2000
2	0.0043	4000
3	0.0053	6000
4	0.0066	8000
5	0.0082	10000
6	0.0106	12000
7	0.0130	14000
8	0.0170	16000
9	0.0212	18000
10	0.0266	20000
11	0.0317	22000
12	0.0379	24000
13	0.0447	26000



TABLE 13

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN 1-L-16, TENSION-TENSION  
 F=12Hz, K2=10, R=0.1, U=25, S=2.5

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.6552	0.0067	85000	2000	3.36 E-6
0.6569	0.0017	95000	10000	1.68 E-7
0.6574	0.0006	105000	10000	5.60 E-8
0.6574	0.0000	110000	5000	0.00 E+0
0.6597	0.0022	115000	5000	4.48 E-7
0.6619	0.0022	120000	5000	4.48 E-7
0.6619	0.0000	125000	5000	0.00 E+0
0.6619	0.0000	127000	2000	0.00 E+0
0.6630	0.0011	129000	2000	5.60 E-7
0.6686	0.0056	131000	2000	2.80 E-6
0.6703	0.0017	133000	2000	8.40 E-7
0.6714	0.0011	135000	2000	5.60 E-7
0.6748	0.0034	137000	2000	1.68 E-6
0.6787	0.0039	139000	2000	1.96 E-6
0.6838	0.0050	141000	2000	2.52 E-6
0.6916	0.0078	143000	2000	3.92 E-6
0.7000	0.0084	145000	2000	4.20 E-6
0.7090	0.0090	147000	2000	4.48 E-6
0.7168	0.0078	149000	2000	3.92 E-6
0.7258	0.0090	151000	2000	4.48 E-6
RUN NO. 2				
0.7314	0.0056	153000	2000	2.80 E-6
0.7336	0.0022	163000	10000	2.24 E-7
0.7336	0.0000	173000	10000	0.00 E+0
0.7336	0.0000	178000	5000	0.00 E+0
0.7347	0.0011	183000	5000	2.24 E-7
0.7358	0.0011	188000	5000	2.24 E-7
0.7358	0.0000	193000	5000	0.00 E+0
0.7364	0.0006	195000	2000	2.80 E-7
0.7409	0.0045	197000	2000	2.24 E-6
0.7442	0.0034	199000	2000	1.68 E-6
0.7465	0.0022	201000	2000	1.12 E-6
0.7487	0.0022	203000	2000	1.12 E-6
0.7504	0.0017	205000	2000	8.40 E-7
0.7526	0.0022	207000	2000	1.12 E-6
0.7582	0.0056	209000	2000	2.80 E-6
0.7644	0.0062	211000	2000	3.08 E-6
0.7700	0.0056	213000	2000	2.80 E-6
0.7784	0.0084	215000	2000	4.20 E-6
0.7874	0.0090	217000	2000	4.48 E-6
0.7963	0.0090	219000	2000	4.48 E-6

TABLE 13 (continued)

## RUN NO. 3

0.8014	0.0050	221000	2000	2.52 E-6
0.8019	0.0006	231000	10000	5.60 E-8
0.8058	0.0039	241000	10000	3.92 E-7
0.8064	0.0006	246000	5000	1.12 E-7
0.8075	0.0011	251000	5000	2.24 E-7
0.8098	0.0022	256000	5000	4.48 E-7
0.8154	0.0056	261000	5000	1.12 E-6
0.8198	0.0045	263000	2000	2.24 E-6
0.8226	0.0028	265000	2000	1.40 E-6
0.8288	0.0062	267000	2000	3.08 E-6
0.8350	0.0062	269000	2000	3.08 E-6
0.8462	0.0112	271000	2000	5.60 E-6
0.8613	0.0151	273000	2000	7.56 E-6
0.8764	0.0151	275000	2000	7.56 E-6
0.8921	0.0157	277000	2000	7.84 E-6
0.9072	0.0151	279000	2000	7.56 E-6
0.9218	0.0146	281000	2000	7.28 E-6
0.9363	0.0146	283000	2000	7.28 E-6
0.9503	0.0140	285000	2000	7.00 E-6
0.9649	0.0146	287000	2000	7.28 E-6

## RUN NO. 4

0.9716	0.0067	289000	2000	3.36 E-6
0.9738	0.0022	299000	10000	2.24 E-7
0.9766	0.0028	309000	10000	2.80 E-7
0.9783	0.0017	314000	5000	3.36 E-7
0.9794	0.0011	319000	5000	2.24 E-7
0.9811	0.0017	324000	5000	3.36 E-7
0.9834	0.0022	329000	5000	4.48 E-7
0.9845	0.0011	331000	2000	5.60 E-7
0.9895	0.0050	333000	2000	2.52 E-6
0.9946	0.0050	335000	2000	2.52 E-6
1.0024	0.0078	337000	2000	3.92 E-6
1.0136	0.0112	339000	2000	5.60 E-6
1.0248	0.0112	341000	2000	5.60 E-6
1.0382	0.0134	343000	2000	6.72 E-6
1.0511	0.0129	345000	2000	6.44 E-6
1.0629	0.0118	347000	2000	5.88 E-6
1.0758	0.0129	349000	2000	6.44 E-6
1.0886	0.0129	351000	2000	6.44 E-6
1.1010	0.0123	353000	2000	6.16 E-6
1.1133	0.0123	355000	2000	6.16 E-6

TABLE 13 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	3.01 E-6	0.0030	1000
2	1.68 E-7	0.0069	7000
3	1.82 E-7	0.0086	17000
4	1.12 E-7	0.0098	24500
5	2.80 E-7	0.0108	29500
6	3.64 E-7	0.0124	34500
7	3.92 E-7	0.0143	39500
8	7.70 E-7	0.0160	43000
9	1.68 E-6	0.0185	45000
10	2.52 E-6	0.0227	47000
11	2.24 E-6	0.0274	49000
12	3.22 E-6	0.0329	51000
13	3.92 E-6	0.0400	53000
14	4.34 E-6	0.0483	55000
15	4.90 E-6	0.0575	57000
16	5.11 E-6	0.0676	59000
17	5.18 E-6	0.0778	61000
18	5.60 E-6	0.0886	63000
19	5.39 E-6	0.0996	65000
20	5.60 E-6	0.1106	67000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0060	2000
2	0.0077	12000
3	0.0095	22000
4	0.0101	27000
5	0.0115	32000
6	0.0133	37000
7	0.0153	42000
8	0.0168	44000
9	0.0202	46000
10	0.0252	48000
11	0.0297	50000
12	0.0361	52000
13	0.0440	54000
14	0.0526	56000
15	0.0624	58000
16	0.0727	60000
17	0.0830	62000
18	0.0942	64000
19	0.1050	66000
20	0.1162	68000

TABLE 14

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 1-L-2, TENSION-TENSION  
 F=12Hz, K2=10, R=0.3, U=16.67, S=2.5

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.6042	0.0028	29750	1000	2.80 E-6
0.6048	0.0006	30750	1000	5.60 E-7
0.6059	0.0011	35750	5000	2.24 E-7
0.6070	0.0011	45750	10000	1.12 E-7
0.6076	0.0006	55750	10000	5.60 E-8
0.6082	0.0006	65750	10000	5.60 E-8
0.6104	0.0022	75750	10000	2.24 E-7
0.6126	0.0022	85750	10000	2.24 E-7
0.6216	0.0090	95750	10000	8.96 E-7
0.6401	0.0185	105750	10000	1.85 E-6
0.6670	0.0269	115750	10000	2.69 E-6
0.6798	0.0129	120750	5000	2.58 E-6
0.6944	0.0146	125750	5000	2.91 E-6
0.7067	0.0123	130750	5000	2.46 E-6
0.7202	0.0134	135750	5000	2.69 E-6
0.7330	0.0129	140750	5000	2.58 E-6
0.7476	0.0146	145750	5000	2.91 E-6
0.7616	0.0140	150750	5000	2.80 E-6
0.7756	0.0140	155750	5000	2.80 E-6
0.7896	0.0140	160750	5000	2.80 E-6
RUN NO. 2				
0.7924	0.0028	161750	1000	2.80 E-6
0.7935	0.0011	162750	1000	1.12 E-6
0.7946	0.0011	167750	5000	2.24 E-7
0.7963	0.0017	177750	10000	1.68 E-7
0.7991	0.0028	187750	10000	2.80 E-7
0.8008	0.0017	197750	10000	1.68 E-7
0.8019	0.0011	207750	10000	1.12 E-7
0.8075	0.0056	217750	10000	5.60 E-7
0.8198	0.0123	227750	10000	1.23 E-6
0.8411	0.0213	237750	10000	2.13 E-6
0.8686	0.0274	247750	10000	2.74 E-6
0.8831	0.0146	252750	5000	2.91 E-6
0.8971	0.0140	257750	5000	2.80 E-6
0.9139	0.0168	262750	5000	3.36 E-6
0.9285	0.0146	267750	5000	2.91 E-6
0.9436	0.0151	272750	5000	3.02 E-6
0.9587	0.0151	277750	5000	3.02 E-6
0.9744	0.0157	282750	5000	3.14 E-6
0.9901	0.0157	287750	5000	3.14 E-6
1.0035	0.0134	292750	5000	2.69 E-6

TABLE 14 (continued)

RUN NO. 3

1.0058	0.0022	293750	1000	2.24 E-6
1.0069	0.0011	294750	1000	1.12 E-6
1.0080	0.0011	299750	5000	2.24 E-7
1.0086	0.0006	309750	10000	5.60 E-8
1.0091	0.0006	319750	10000	5.60 E-8
1.0102	0.0011	329750	10000	1.12 E-7
1.0114	0.0011	339750	10000	1.12 E-7
1.0130	0.0017	349750	10000	1.68 E-7
1.0164	0.0034	359750	10000	3.36 E-7
1.0259	0.0095	369750	10000	9.52 E-7
1.0354	0.0095	379750	10000	9.52 E-7
1.0438	0.0084	384750	5000	1.68 E-6
1.0550	0.0112	389750	5000	2.24 E-6
1.0696	0.0146	394750	5000	2.91 E-6
1.0825	0.0129	399750	5000	2.58 E-6
1.0965	0.0140	404750	5000	2.80 E-6
1.1122	0.0157	409750	5000	3.14 E-6
1.1262	0.0140	414750	5000	2.80 E-6
1.1418	0.0157	419750	5000	3.14 E-6
1.1581	0.0162	424750	5000	3.25 E-6

TABLE 14 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	2.61 E-6	0.0013	500
2	9.33 E-7	0.0031	1500
3	2.24 E-7	0.0041	4500
4	1.12 E-7	0.0052	12000
5	1.31 E-7	0.0064	22000
6	1.12 E-7	0.0077	32000
7	1.49 E-7	0.0090	42000
8	3.17 E-7	0.0113	52000
9	8.21 E-7	0.0170	62000
10	1.64 E-6	0.0293	72000
11	2.13 E-6	0.0482	82000
12	2.39 E-6	0.0648	89500
13	2.65 E-6	0.0774	94500
14	2.91 E-6	0.0913	99500
15	2.73 E-6	0.1054	104500
16	2.80 E-6	0.1192	109500
17	3.02 E-6	0.1337	114500
18	2.91 E-6	0.1486	119500
19	3.02 E-6	0.1634	124500
20	2.91 E-6	0.1783	129500

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0026	1000
2	0.0035	2000
3	0.0047	7000
4	0.0058	17000
5	0.0071	27000
6	0.0082	37000
7	0.0097	47000
8	0.0129	57000
9	0.0211	67000
10	0.0375	77000
11	0.0588	87000
12	0.0707	92000
13	0.0840	97000
14	0.0986	102000
15	0.1122	107000
16	0.1262	112000
17	0.1413	117000
18	0.1559	122000
19	0.1710	127000
20	0.1855	132000

TABLE 15

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 3-L-8, TENSION-TENSION  
 F=12Hz, K2=10, R=0.3, U=8.33, S=2.5

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.6038	0.0028	26000	.2000	1.39 E-6
0.6055	0.0017	46000	20000	8.35 E-8
0.6055	0.0000	66000	20000	0.00 E+0
0.6055	0.0000	86000	20000	0.00 E+0
0.6055	0.0000	106000	20000	0.00 E+0
0.6055	0.0000	126000	20000	0.00 E+0
0.6194	0.0139	146000	20000	6.94 E-7
0.6327	0.0133	153000	7000	1.91 E-6
0.6427	0.0100	157000	4000	2.50 E-6
0.6532	0.0105	161000	4000	2.64 E-6
0.6660	0.0128	165000	4000	3.19 E-6
0.6782	0.0122	169000	4000	3.05 E-6
0.6932	0.0150	173000	4000	3.75 E-6
0.7060	0.0128	177000	4000	3.19 E-6
0.7193	0.0133	181000	4000	3.33 E-6
0.7320	0.0128	185000	4000	3.19 E-6

TABLE 15 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	1.39 E-6	0.0014	1000
2	8.35 E-8	0.0037	12000
3	0.00 E+0	0.0045	32000
4	0.00 E+0	0.0045	52000
5	0.00 E+0	0.0045	72000
6	0.00 E+0	0.0045	92000
7	6.94 E-7	0.0115	112000
8	1.91 E-6	0.0251	125500
9	2.50 E-6	0.0367	131000
10	2.64 E-6	0.0470	135000
11	3.19 E-6	0.0586	139000
12	3.05 E-6	0.0711	143000
13	3.75 E-6	0.0847	147000
14	3.19 E-6	0.0985	151000
15	3.33 E-6	0.1116	155000
16	3.19 E-6	0.1246	159000

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0028	2000
2	0.0045	22000
3	0.0045	42000
4	0.0045	62000
5	0.0045	82000
6	0.0045	102000
7	0.0184	122000
8	0.0317	129000
9	0.0417	133000
10	0.0522	137000
11	0.0650	141000
12	0.0772	145000
13	0.0922	149000
14	0.1049	153000
15	0.1182	157000
16	0.1310	161000



TABLE 16

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 6-L-15, TENSION-TENSION  
 $F = 12\text{Hz}$ ,  $K_2 = 10$ ,  $R = 0.3$ ,  $U = 8.66$ ,  $S = 2.6$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.4474	0.0028	5000	1000	2.80 E-6
0.4491	0.0017	30000	25000	6.72 E-8
0.4491	0.0000	55000	25000	0.00 E+0
0.4497	0.0006	80000	25000	2.24 E-8
0.4508	0.0011	105000	25000	4.48 E-8
0.4514	0.0006	130000	25000	2.24 E-8
0.4589	0.0076	155000	25000	3.02 E-7
0.4810	0.0221	165000	10000	2.21 E-6

Test performed to zero-in on overload shut-off ratio. Test terminated prior to reaching  $(da/dN)_c$ .

TABLE 17

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 6-L-15, TENSION-TENSION

$F = 12\text{Hz}$ ,  $K_2 = 10$ ,  $R = 0.3$ ,  $U = 9.33$ ,  $S = 2.8$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.5460	0.0025	10000	1000	2.52 E-6
0.5482	0.0022	35000	25000	8.96 E-8
0.5482	0.0000	60000	25000	0.00 E+0
0.5482	0.0000	85000	25000	0.00 E+0
0.5482	0.0000	110000	25000	0.00 E+0
0.5494	0.0011	135000	25000	4.48 E-8
0.5494	0.0000	160000	25000	0.00 E+0
0.5494	0.0000	185000	25000	0.00 E+0
0.5494	0.0000	210000	25000	0.00 E+0
0.5494	0.0000	235000	25000	0.00 E+0
0.5494	0.0000	260000	25000	0.00 E+0
0.5494	0.0000	285000	25000	0.00 E+0
0.5494	0.0000	310000	25000	0.00 E+0
0.5494	0.0000	335000	25000	0.00 E+0
0.5494	0.0000	360000	25000	0.00 E+0
0.5494	0.0000	385000	25000	0.00 E+0
0.5494	0.0000	410000	25000	0.00 E+0
0.5494	0.0000	435000	25000	0.00 E+0
0.5494	0.0000	460000	25000	0.00 E+0
0.5494	0.0000	485000	25000	0.00 E+0
0.5494	0.0000	510000	25000	0.00 E+0
0.5494	0.0000	535000	25000	0.00 E+0
0.5494	0.0000	560000	25000	0.00 E+0
0.5659	0.0165	585000	25000	6.61 E-7
0.5734	0.0076	587000	2000	3.78 E-6

Test performed to zero-in on overload shut-off ratio. Test terminated prior to reaching  $(da/dN)_c$ .

TABLE 18

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 5-L-6, TENSION-TENSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.3$ ,  $U=9.67$ ,  $S=2.9$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.1684	0.0028	7000	1000	2.80 E-6
1.1701	0.0017	32000	25000	6.72 E-8
1.1701	0.0000	57000	25000	0.00 E+0
1.1707	0.0006	82000	25000	2.24 E-8
1.1707	0.0000	107000	25000	0.00 E+0
1.1707	0.0000	132000	25000	0.00 E+0
1.1707	0.0000	157000	25000	0.00 E+0
1.1707	0.0000	182000	25000	0.00 E+0
1.1707	0.0000	207000	25000	0.00 E+0
1.1707	0.0000	232000	25000	0.00 E+0
1.1710	0.0003	257000	25000	1.12 E-8
1.1710	0.0000	282000	25000	0.00 E+0
1.1710	0.0000	307000	25000	0.00 E+0
1.1712	0.0003	332000	25000	1.12 E-8
1.1712	0.0000	357000	25000	0.00 E+0
1.1712	0.0000	382000	25000	0.00 E+0
1.1712	0.0000	407000	25000	0.00 E+0
1.1712	0.0000	432000	25000	0.00 E+0
1.1712	0.0000	457000	25000	0.00 E+0
1.1712	0.0000	482000	25000	0.00 E+0
1.1712	0.0000	507000	25000	0.00 E+0
1.1712	0.0000	532000	25000	0.00 E+0
1.1712	0.0000	557000	25000	0.00 E+0
1.1712	0.0000	582000	25000	0.00 E+0
1.1712	0.0000	607000	25000	0.00 E+0
1.1712	0.0000	632000	25000	0.00 E+0
1.1712	0.0000	657000	25000	0.00 E+0
1.1712	0.0000	682000	25000	0.00 E+0
1.1712	0.0000	707000	25000	0.00 E+0

$S=2.9$  considered to be overload shut-off ratio for this case.

TABLE 19  
EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
TEMPERATURE DESICCATED AIR  
SPECIMEN NO. 2-L-14, TENSION-TENSION  
F=12Hz, K<sub>2</sub>=10, R=0.5, U=10, S=2.5

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.3745	0.0017	25000	1000	1.68 E-6
1.3759	0.0014	45000	20000	7.00 E-8
1.3765	0.0006	65000	20000	2.80 E-8
1.3768	0.0003	85000	20000	1.40 E-8
1.3768	0.0000	105000	20000	0.00 E+0
1.3773	0.0006	125000	20000	2.80 E-8
1.3779	0.0006	145000	20000	2.80 E-8
1.3801	0.0022	165000	20000	1.12 E-7
1.3824	0.0022	175000	10000	2.24 E-7
1.3871	0.0048	185000	10000	4.76 E-7
1.3880	0.0008	187000	2000	4.20 E-7
1.3894	0.0014	189000	2000	7.00 E-7
1.3910	0.0017	191000	2000	8.40 E-7
1.3924	0.0014	193000	2000	7.00 E-7
1.3938	0.0014	195000	2000	7.00 E-7
1.3955	0.0017	197000	2000	8.40 E-7
1.3978	0.0022	199000	2000	1.12 E-6
1.3994	0.0017	201000	2000	8.40 E-7
1.4014	0.0020	203000	2000	9.80 E-7
1.4034	0.0020	205000	2000	9.80 E-7
1.4056	0.0022	207000	2000	1.12 E-6
1.4081	0.0025	209000	2000	1.26 E-6
1.4106	0.0025	211000	2000	1.26 E-6
1.4126	0.0020	213000	2000	9.80 E-7
1.4148	0.0022	215000	2000	1.12 E-6
1.4162	0.0014	217000	2000	7.00 E-7
1.4182	0.0020	219000	2000	9.80 E-7
1.4207	0.0025	221000	2000	1.26 E-6
1.4232	0.0025	223000	2000	1.26 E-6

TABLE 19 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	1.68 E-6	0.0008	500
2	7.00 E-8	0.0024	11000
3	2.80 E-8	0.0034	31000
4	1.40 E-8	0.0038	51000
5	0.00 E+0	0.0039	71000
6	2.80 E-8	0.0042	91000
7	2.80 E-8	0.0043	111000
8	1.12 E-7	0.0062	131000
9	2.24 E-7	0.0084	146000
10	4.76 E-7	0.0119	156000
11	4.20 E-7	0.0147	162000
12	7.00 E-7	0.0158	164000
13	8.40 E-7	0.0174	166000
14	7.00 E-7	0.0189	168000
15	7.00 E-7	0.0203	170000
16	8.40 E-7	0.0218	172000
17	1.12 E-6	0.0233	174000
18	8.40 E-7	0.0258	176000
19	9.80 E-7	0.0276	178000
20	9.80 E-7	0.0295	180000
21	1.12 E-6	0.0316	182000
22	1.26 E-6	0.0340	184000
23	1.26 E-6	0.0365	186000
24	9.80 E-7	0.0388	188000
25	1.12 E-6	0.0409	190000
26	7.00 E-7	0.0427	192000
27	9.80 E-7	0.0444	194000
28	1.26 E-6	0.0466	196000
29	1.26 E-6	0.0491	198000

TABLE 19 (continued)

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0017	1000
2	0.0031	21000
3	0.0036	41000
4	0.0039	61000
5	0.0039	81000
6	0.0045	101000
7	0.0050	121000
8	0.0073	141000
9	0.0095	151000
10	0.0143	161000
11	0.0151	163000
12	0.0165	165000
13	0.0182	167000
14	0.0196	169000
15	0.0210	171000
16	0.0227	173000
17	0.0249	175000
18	0.0266	177000
19	0.0286	179000
20	0.0305	181200
21	0.0328	183000
22	0.0353	185000
23	0.0378	187000
24	0.0398	189000
25	0.0420	191000
26	0.0434	193000
27	0.0454	195000
28	0.0479	197000
29	0.0504	199000

TABLE 20  
EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
TEMPERATURE DESICCATED AIR  
SPECIMEN NO. 4-I-4, TENSION-TENSION  
 $K_2=10$ ,  $R=0.5$ ,  $U=10.4$ ,  $S=2.6$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.4446	0.0006	166000	1000	5.60 E-7
0.4452	0.0006	176000	10000	5.60 E-8
0.4460	0.0003	186000	10000	8.40 E-8
0.4460	0.0000	196000	10000	0.00 E+0
0.4463	0.0003	206000	10000	2.80 E-8
0.4463	0.0000	216000	10000	0.00 E+0
0.4463	0.0000	226000	10000	0.00 E+0
0.4463	0.0000	236000	10000	0.00 E+0
0.4469	0.0006	246000	10000	5.60 E-8
0.4469	0.0000	256000	10000	0.00 E+0
0.4505	0.0036	266000	10000	3.64 E-7
0.4530	0.0025	276000	10000	2.52 E-7
0.4556	0.0025	286000	10000	2.52 E-7
0.4584	0.0028	296000	10000	2.80 E-7
0.4609	0.0025	306000	10000	2.52 E-7
0.4670	0.0062	316000	10000	6.16 E-7

Test performed to zero-in on overload shut-off ratio. Test terminated prior to reaching  $(da/dN)_c$ .

TABLE 21  
EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
TEMPERATURE DESICCATED AIR  
SPECIMEN NO. 4-L-4, TENSION-TENSION  
 $K_2=10$ ,  $R=0.5$ ,  $U=10.8$ ,  $S=2.7$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.5942	0.0011	104000	1000	1.12 E-6
0.5958	0.0017	144000	40000	4.20 E-8
0.5958	0.0000	184000	40000	0.00 E+0
0.5961	0.0003	224000	40000	7.00 E-9
0.5961	0.0000	264000	40000	0.00 E+0
0.5961	0.0000	304000	40000	0.00 E+0
0.5961	0.0000	344000	40000	0.00 E+0
0.5961	0.0000	384000	40000	0.00 E+0
0.5961	0.0000	424000	40000	0.00 E+0
0.5964	0.0003	464000	40000	7.00 E-9
0.5964	0.0000	504000	40000	0.00 E+0
0.5964	0.0000	524000	20000	0.00 E+0
0.5964	0.0000	544000	20000	0.00 E+0
0.5964	0.0000	564000	20000	0.00 E+0
0.5964	0.0000	584000	20000	0.00 E+0
0.5964	0.0000	604000	20000	0.00 E+0
0.5964	0.0000	624000	20000	0.00 E+0
0.5964	0.0000	644000	20000	0.00 E+0
0.5964	0.0000	664000	20000	0.00 E+0
0.5964	0.0000	684000	20000	0.00 E+0
0.5964	0.0000	704000	20000	0.00 E+0
0.5964	0.0000	724000	20000	0.00 E+0
0.5964	0.0000	744000	20000	0.00 E+0
0.5964	0.0000	764000	20000	0.00 E+0
0.5964	0.0000	784000	20000	0.00 E+0
0.5964	0.0000	804000	20000	0.00 E+0
0.5964	0.0000	824000	20000	0.00 E+0
0.5964	0.0000	844000	20000	0.00 E+0
0.5964	0.0000	864000	20000	0.00 E+0

Test performed to zero-in on overload shut-off ratio.  $S=2.7$  considered to be shut-off ratio for this case.



TABLE 22

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 4-L-4, TENSION-TENSION  
 $K_2=10$ ,  $R=0.5$ ,  $U=5.0$ ,  $S=2.5$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.7406	0.0014	6000	2000	7.00 E-7
0.7412	0.0006	46000	40000	1.40 E-8
0.7412	0.0000	86000	40000	0.00 E+0
0.7412	0.0000	126000	40000	0.00 E+0
0.7412	0.0000	166000	40000	0.00 E+0
0.7417	0.0006	206000	40000	1.40 E-8
0.7420	0.0003	246000	40000	7.00 E-9
0.7420	0.0000	286000	40000	0.00 E+0
0.7420	0.0000	326000	40000	0.00 E+0
0.7420	0.0000	366000	40000	0.00 E+0
0.7420	0.0000	406000	40000	0.00 E+0
0.7420	0.0000	426000	20000	0.00 E+0
0.7420	0.0000	446000	20000	0.00 E+0
0.7420	0.0000	466000	20000	0.00 E+0
0.7420	0.0000	486000	20000	0.00 E+0
0.7420	0.0000	506000	20000	0.00 E+0
0.7420	0.0000	526000	20000	0.00 E+0
0.7420	0.0000	546000	20000	0.00 E+0
0.7420	0.0000	566000	20000	0.00 E+0
0.7420	0.0000	586000	20000	0.00 E+0
0.7420	0.0000	606000	20000	0.00 E+0
0.7420	0.0000	626000	20000	0.00 E+0
0.7420	0.0000	646000	20000	0.00 E+0
0.7420	0.0000	666000	20000	0.00 E+0
0.7420	0.0000	686000	20000	0.00 E+0
0.7420	0.0000	706000	20000	0.00 E+0
0.7420	0.0000	726000	20000	0.00 E+0

Both crack tips shut-off.

TABLE 23  
EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
TEMPERATURE DESICCATED AIR  
SPECIMEN NO. 4-L-4, TENSION-TENSION  
 $K_2=10$ ,  $R=0.5$ ,  $U=4.6$ ,  $S=2.3$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.8658	0.0022	5000	1000	2.24 E-6
0.8663	0.0006	45000	40000	1.40 E-8
0.8663	0.0000	85000	40000	0.00 E+0
0.8663	0.0000	125000	40000	0.00 E+0
0.8663	0.0000	165000	40000	0.00 E+0
0.8663	0.0000	205000	40000	0.00 E+0
0.8663	0.0000	245000	40000	0.00 E+0
0.8663	0.0000	285000	40000	0.00 E+0
0.8663	0.0000	325000	40000	0.00 E+0
0.8663	0.0000	365000	40000	0.00 E+0
0.8666	0.0003	405000	40000	7.00 E-9
0.8666	0.0000	425000	20000	0.00 E+0
0.8669	0.0003	445000	20000	1.40 E-8
0.8775	0.0106	465000	20000	5.32 E-7

Test performed to zero-in on overload shut-off ratio. Test terminated prior to reaching  $(da/dN)_c$ .

TABLE 24

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 4-L-4, TENSION-TENSION  
 $K_2 = 10$ ,  $R = 0.5$ ,  $U = 4.8$ ,  $S = 2.4$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.9640	0.0022	5000	1000	2.24 E-6
0.9643	0.0003	45000	40000	7.00 E-9
0.9643	0.0000	85000	40000	0.00 E+0
0.9643	0.0000	125000	40000	0.00 E+0
0.9643	0.0000	165000	40000	0.00 E+0
0.9643	0.0000	205000	40000	0.00 E+0
0.9643	0.0000	245000	40000	0.00 E+0
0.9643	0.0000	285000	40000	0.00 E+0
0.9643	0.0000	325000	40000	0.00 E+0
0.9643	0.0000	365000	40000	0.00 E+0
0.9643	0.0000	405000	40000	0.00 E+0
0.9643	0.0000	425000	20000	0.00 E+0
0.9643	0.0000	445000	20000	0.00 E+0
0.9643	0.0000	465000	20000	0.00 E+0
0.9643	0.0000	485000	20000	0.00 E+0
0.9643	0.0000	505000	20000	0.00 E+0
0.9646	0.0003	525000	20000	1.40 E-8
0.9646	0.0000	545000	20000	0.00 E+0
0.9646	0.0000	565000	20000	0.00 E+0
0.9646	0.0000	585000	20000	0.00 E+0
0.9646	0.0000	605000	20000	0.00 E+0
0.9646	0.0000	625000	20000	0.00 E+0
0.9646	0.0000	645000	20000	0.00 E+0
0.9646	0.0000	665000	20000	0.00 E+0
0.9646	0.0000	685000	20000	0.00 E+0
0.9646	0.0000	705000	20000	0.00 E+0
0.9646	0.0000	725000	20000	0.00 E+0

Test performed to zero-in on overload shut-off ratio.  $S = 2.4$   
 considered to be shut-off ratio for this case.

TABLE 25

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 4-L-8, TENSION-TENSION  
 $f=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.1$ ,  $U=30$ ,  $S=3.0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.2622	0.0062	6000	1000	6.16 E-6
1.2656	0.0034	26000	20000	1.68 E-7
1.2667	0.0011	46000	20000	5.60 E-8
1.2667	0.0000	66000	20000	0.00 E+0
1.2678	0.0011	86000	20000	5.60 E-8
1.2690	0.0011	106000	20000	5.60 E-8
1.2712	0.0022	126000	20000	1.12 E-7
1.2712	0.0000	146000	20000	0.00 E+0
1.2723	0.0011	166000	20000	5.60 E-8
1.2734	0.0011	186000	20000	5.60 E-8
1.2762	0.0028	206000	20000	1.40 E-7
1.2897	0.0134	226000	20000	6.72 E-7
1.3205	0.0308	234000	8000	3.85 E-6
1.3507	0.0302	242000	8000	3.78 E-6
1.3793	0.0286	250000	8000	3.57 E-6
1.4112	0.0319	258000	8000	3.99 E-6
1.4291	0.0179	262000	4000	4.48 E-6
1.4459	0.0168	266000	4000	4.20 E-6
1.4638	0.0179	270000	4000	4.48 E-6
1.4818	0.0179	274000	4000	4.48 E-6
1.4918	0.0101	276000	2000	5.04 E-6
1.5019	0.0101	278000	2000	5.04 E-6
1.5109	0.0090	280000	2000	4.48 E-6
1.5210	0.0101	282000	2000	5.04 E-6
1.5299	0.0090	284000	2000	4.48 E-6
1.5389	0.0090	286000	2000	4.48 E-6
1.5478	0.0090	288000	2000	4.48 E-6
1.5568	0.0090	290000	2000	4.48 E-6
1.5658	0.0090	292000	2000	4.48 E-6

TABLE 25 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	6.16 E-6	0.0031	500
2	1.68 E-7	0.0078	11000
3	5.60 E-8	0.0101	31000
4	0.00 E+0	0.0106	51000
5	5.60 E-8	0.0112	71000
6	5.60 E-8	0.0123	91000
7	1.12 E-7	0.0140	111000
8	0.00 E+0	0.0151	131000
9	5.60 E-8	0.0157	151000
10	5.60 E-8	0.0168	171000
11	1.40 E-7	0.0188	191000
12	6.72 E-7	0.0269	211000
13	3.85 E-6	0.0490	225000
14	3.78 E-6	0.0795	233000
15	3.57 E-6	0.1089	241000
16	3.99 E-6	0.1392	249000
17	4.48 E-6	0.1641	255000
18	4.20 E-6	0.1814	259000
19	4.48 E-6	0.1988	263000
20	4.48 E-6	0.2167	267000
21	5.04 E-6	0.2307	270000
22	5.04 E-6	0.2408	272000
23	4.48 E-6	0.2503	274000
24	5.04 E-6	0.2598	276000
25	4.48 E-6	0.2694	278000
26	4.48 E-6	0.2783	280000
27	4.48 E-6	0.2873	282000
28	4.48 E-6	0.2962	284000
29	4.48 E-6	0.3052	286000

TABLE 25 (continued)

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0062	1000
2	0.0095	21000
3	0.0106	41000
4	0.0106	61000
5	0.0118	81000
6	0.0129	101000
7	0.0151	121000
8	0.0151	141000
9	0.0162	161000
10	0.0174	181000
11	0.0202	201000
12	0.0336	221000
13	0.0644	229000
14	0.0946	237000
15	0.1232	245000
16	0.1551	253000
17	0.1730	257000
18	0.1898	261000
19	0.2078	265000
20	0.2257	269000
21	0.2358	271000
22	0.2458	273000
23	0.2548	275000
24	0.2649	277000
25	0.2738	279000
26	0.2828	281000
27	0.2918	283000
28	0.3007	285000
29	0.3097	287000

Data for one crack tip.

TABLE 26

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 4-L-4, TENSION-TENSION  
 $F = 12\text{Hz}$ ,  $K_2 = 10$ ,  $R = 0.1$ ,  $U = 31$ ,  $S = 3.1$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.3826	0.0028	6000	1000	2.80 E-6
1.3888	0.0062	31000	25000	2.46 E-7
1.3899	0.0011	56000	25000	4.48 E-8
1.3910	0.0011	81000	25000	4.48 E-8
1.3922	0.0011	106000	25000	4.48 E-8
1.3922	0.0000	131000	25000	0.00 E+0
1.3922	0.0000	156000	25000	0.00 E+0
1.3922	0.0000	181000	25000	0.00 E+0
1.3924	0.0003	206000	25000	1.12 E-8
1.3924	0.0000	231000	25000	0.00 E+0
1.3924	0.0000	256000	25000	0.00 E+0
1.3924	0.0000	281000	25000	0.00 E+0
1.3924	0.0000	306000	25000	0.00 E+0
1.3941	0.0017	331000	25000	6.72 E-8
1.3941	0.0000	356000	25000	0.00 E+0
1.3944	0.0003	381000	25000	1.12 E-8
1.3944	0.0000	406000	25000	0.00 E+0
1.3950	0.0006	431000	25000	2.24 E-8
1.3950	0.0000	456000	25000	0.00 E+0
1.3950	0.0000	481000	25000	0.00 E+0
1.3950	0.0000	506000	25000	0.00 E+0
1.3950	0.0000	531000	25000	0.00 E+0
1.3989	0.0039	556000	25000	1.57 E-7
1.4008	0.0020	581000	25000	7.84 E-8
1.4137	0.0129	591000	10000	1.29 E-6

Test performed to zero-in on overload shut-off ratio. Test terminated prior to reaching  $(da/dN)_c$ .

TABLE 27

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 5-I-6, TENSION-TENSION  
 F=12Hz,  $K_2=10$ , R=0.1, U=32, S=3.2

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.8392	0.0034	5000	1000	3.36 E-6
0.8431	0.0039	30000	25000	1.57 E-7
0.8439	0.0008	55000	25000	3.36 E-8
0.8445	0.0006	80000	25000	2.24 E-8
0.8450	0.0006	105000	25000	2.24 E-8
0.8453	0.0003	130000	25000	1.12 E-8
0.8453	0.0000	155000	25000	0.00 E+0
0.8456	0.0003	180000	25000	1.12 E-8
0.8456	0.0000	205000	25000	0.00 E+0
0.8456	0.0000	230000	25000	0.00 E+0
0.8456	0.0000	255000	25000	0.00 E+0
0.8456	0.0000	280000	25000	0.00 E+0
0.8456	0.0000	305000	25000	0.00 E+0
0.8456	0.0000	330000	25000	0.00 E+0
0.8456	0.0000	355000	25000	0.00 E+0
0.8459	0.0003	380000	25000	1.12 E-8
0.8459	0.0000	405000	25000	0.00 E+0
0.8459	0.0000	430000	25000	0.00 E+0
0.8459	0.0000	455000	25000	0.00 E+0
0.8459	0.0000	480000	25000	0.00 E+0
0.8459	0.0000	505000	25000	0.00 E+0
0.8459	0.0000	530000	25000	0.00 E+0
0.8459	0.0000	555000	25000	0.00 E+0
0.8459	0.0000	580000	25000	0.00 E+0
0.8459	0.0000	605000	25000	0.00 E+0
0.8459	0.0000	630000	25000	0.00 E+0
0.8459	0.0000	655000	25000	0.00 E+0
0.8459	0.0000	680000	25000	0.00 E+0
0.8459	0.0000	705000	25000	0.00 E+0

S=3.2 considered to be overload shut-off ratio for this condition.



TABLE 28

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 1-L-13, TENSION-TENSION  
 F=12Hz, K2=10, R=0.3, U=20, S= 3.0

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.5356	0.0028	15000	1000	2.77 E-6
0.5372	0.0018	175000	160000	1.04 E-8
0.5439	0.0068	335000	160000	4.02 E-8
0.5467	0.0029	495000	160000	2.37 E-8
0.5478	0.0011	575000	80000	1.39 E-8
0.5511	0.0044	615000	40000	1.11 E-7
0.5989	0.0478	635000	20000	3.06 E-6
0.6487	0.0493	655000	20000	3.22 E-6
0.7087	0.0600	675000	20000	3.00 E-6
0.7585	0.0493	690000	15000	3.34 E-6
0.8149	0.0564	705000	15000	3.78 E-6
0.8261	0.0112	708000	3000	3.70 E-6
0.8395	0.0134	711000	3000	4.44 E-6
0.8495	0.0100	714000	3000	3.34 E-6

TABLE 28 (cont'd)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	2.77 E-6	0.0014	500
2	1.04 E-8	0.0037	81000
3	4.02 E-8	0.0080	241000
4	2.37 E-8	0.0129	401000
5	1.39 E-8	0.0149	521000
6	1.11 E-7	0.0176	581000
7	3.06 E-6	0.0437	611000
8	3.22 E-6	0.0925	631000
9	3.00 E-6	0.1474	651000
10	3.34 E-6	0.2023	668500
11	3.78 E-6	0.2554	683500
12	3.70 E-6	0.2892	692500
13	4.44 E-6	0.3015	695500
14	3.34 E-6	0.3132	698500

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0028	1000
2	0.0046	161000
3	0.0114	321000
4	0.0143	481000
5	0.0154	561000
6	0.0198	601000
7	0.0676	621000
8	0.1174	641000
9	0.1774	661000
10	0.2272	676000
11	0.2836	691000
12	0.2948	694000
13	0.3082	697000
14	0.3182	700000

Data adjusted to reflect growth at only one crack tip.

TABLE 29

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN 2-L-8, TENSION - TENSION  
 F=12Hz, K2=10, R=0.3, U=20.67, S=3.1

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.6160	0.0022	32000	2000	1.12 E-6
0.6199	0.0039	112000	80000	4.90 E-8
0.6199	0.0000	192000	80000	0.00 E+0
0.6233	0.0034	272000	80000	4.20 E-8
0.6238	0.0006	352000	80000	7.00 E-9
0.6238	0.0000	432000	80000	0.00 E+0
0.6255	0.0017	512000	80000	2.10 E-8
0.6266	0.0011	592000	80000	1.40 E-8
0.6266	0.0000	672000	80000	0.00 E+0
0.6266	0.0000	752000	80000	0.00 E+0
0.6272	0.0006	832000	80000	7.00 E-9
0.6278	0.0006	912000	80000	7.00 E-9
0.6278	0.0000	992000	80000	0.00 E+0
0.6278	0.0000	1072000	80000	0.00 E+0
0.6278	0.0000	1152000	80000	0.00 E+0
0.6278	0.0000	1232000	80000	0.00 E+0
0.6278	0.0000	1312000	80000	0.00 E+0

Both crack tips shut-off.

Data Tabulations for Tension-Tension Load Class,  
 $K_2=7.78$  and  $14 \text{ KSI } \sqrt{\text{In.}}$

TABLE 30

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 6-L-21, TENSION-TENSION  
 $F=12\text{Hz}$ ,  $K_2=7.78$ ,  $R=0.1$ ,  $U=15$ ,  $S=1.5$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.9615	0.0011	26000	1000	1.12 E-6
0.9626	0.0011	28000	2000	5.60 E-7
0.9643	0.0017	30000	2000	8.40 E-7
0.9677	0.0034	32000	2000	1.68 E-6
0.9705	0.0028	34000	2000	1.40 E-6
0.9738	0.0034	36000	2000	1.68 E-6
0.9772	0.0034	38000	2000	1.68 E-6
0.9808	0.0036	40000	2000	1.82 E-6
0.9845	0.0036	42000	2000	1.82 E-6
0.9887	0.0042	44000	2000	2.10 E-6
RUN NO. 2				
0.9895	0.0008	45000	1000	8.40 E-7
0.9912	0.0017	47000	2000	8.40 E-7
0.9929	0.0017	49000	2000	8.40 E-7
0.9957	0.0028	51000	2000	1.40 E-6
0.9985	0.0028	53000	2000	1.40 E-6
1.0016	0.0031	55000	2000	1.54 E-6
1.0058	0.0042	57000	2000	2.10 E-6
1.0100	0.0042	59000	2000	2.10 E-6
1.0142	0.0042	61000	2000	2.10 E-6
1.0172	0.0031	63000	2000	1.54 E-6
RUN NO. 3				
1.0189	0.0017	64000	1000	1.68 E-6
1.0203	0.0014	66000	2000	7.00 E-7
1.0220	0.0017	68000	2000	8.40 E-7
1.0242	0.0022	70000	2000	1.12 E-6
1.0273	0.0031	72000	2000	1.54 E-6
1.0304	0.0031	74000	2000	1.54 E-6
1.0343	0.0039	76000	2000	1.96 E-6
1.0385	0.0042	78000	2000	2.10 E-6
1.0422	0.0036	80000	2000	1.82 E-6
1.0461	0.0039	82000	2000	1.96 E-6

TABLE 30 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	1.21 E-6	0.0006	500
2	7.00 E-7	0.0019	2000
3	8.40 E-7	0.0035	4000
4	1.40 E-6	0.0057	6000
5	1.45 E-6	0.0085	8000
6	1.59 E-6	0.0116	10000
7	1.91 E-6	0.0151	12000
8	2.01 E-6	0.0190	14000
9	1.91 E-6	0.0229	16000
10	1.87 E-6	0.0267	18000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0012	1000
2	0.0026	3000
3	0.0043	5000
4	0.0071	7000
5	0.0100	9000
6	0.0132	11000
7	0.0170	13000
8	0.0210	15000
9	0.0248	17000
10	0.0286	19000

TABLE 31

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 5-L-20, TENSION-TENSION  
 $F=12\text{Hz}$ ,  $K_2=7.78$ ,  $R=0.1$ ,  $U=20$ ,  $S=2.0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.8294	0.0022	13000	1000	2.24 E-6
0.8299	0.0006	17000	4000	1.40 E-7
0.8310	0.0011	21000	4000	2.80 E-7
0.8350	0.0039	25000	4000	9.80 E-7
0.8375	0.0025	27000	2000	1.26 E-6
0.8397	0.0022	29000	2000	1.12 E-6
0.8420	0.0022	31000	2000	1.12 E-6
0.8456	0.0036	33000	2000	1.82 E-6
0.8484	0.0028	35000	2000	1.40 E-6
0.8509	0.0025	37000	2000	1.26 E-6
0.8548	0.0039	39000	2000	1.96 E-6
0.8607	0.0059	41000	2000	2.94 E-6
0.8641	0.0034	43000	2000	1.68 E-6
RUN NO. 2				
0.8845	0.0011	52000	1000	1.12 E-6
0.8851	0.0006	56000	4000	1.40 E-7
0.8876	0.0025	60000	4000	6.30 E-7
0.8915	0.0039	64000	4000	9.80 E-7
0.8940	0.0025	66000	2000	1.26 E-6
0.8971	0.0031	68000	2000	1.54 E-6
0.9002	0.0031	70000	2000	1.54 E-6
0.9038	0.0036	72000	2000	1.82 E-6
0.9072	0.0034	74000	2000	1.68 E-6
0.9106	0.0034	76000	2000	1.68 E-6
0.9142	0.0036	78000	2000	1.82 E-6
0.9181	0.0039	80000	2000	1.96 E-6
0.9220	0.0039	82000	2000	1.96 E-6
RUN NO. 3				
0.9386	0.0014	91000	1000	1.40 E-6
0.9402	0.0017	95000	4000	4.20 E-7
0.9414	0.0011	99000	4000	2.80 E-7
0.9447	0.0034	103000	4000	8.40 E-7
0.9461	0.0014	105000	2000	7.00 E-7
0.9500	0.0039	107000	2000	1.96 E-6
0.9534	0.0034	109000	2000	1.68 E-6
0.9570	0.0036	111000	2000	1.82 E-6
0.9612	0.0042	113000	2000	2.10 E-6
0.9652	0.0039	115000	2000	1.96 E-6
0.9694	0.0042	117000	2000	2.10 E-6
0.9733	0.0039	119000	2000	1.96 E-6
0.9775	0.0042	121000	2000	2.10 E-6

TABLE 31 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	1.59 E-6	0.0008	500
2	2.33 E-7	0.0021	3000
3	3.97 E-7	0.0033	7000
4	9.33 E-7	0.0060	11000
5	1.07 E-6	0.0089	14000
6	1.54 E-6	0.0115	16000
7	1.45 E-6	0.0145	18000
8	1.82 E-6	0.0178	20000
9	1.73 E-6	0.0213	22000
10	1.63 E-6	0.0247	24000
11	1.96 E-6	0.0283	26000
12	2.29 E-6	0.0325	28000
13	1.91 E-6	0.0367	30000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0016	1000
2	0.0025	5000
3	0.0041	9000
4	0.0078	13000
5	0.0100	15000
6	0.0131	17000
7	0.0160	19000
8	0.0196	21000
9	0.0231	23000
10	0.0263	25000
11	0.0302	27000
12	0.0348	29000
13	0.0386	31000



TABLE 32

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 3-L-15, TENSION-TENSION  
 $F=12\text{Hz}$ ,  $K_2=7.78$ ,  $R=0.1$ ,  $U=25$ ,  $S=2.5$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.1990	0.0022	2000	1000	2.24 E-6
1.2006	0.0017	7000	5000	3.36 E-7
1.2012	0.0006	12000	5000	1.12 E-7
1.2023	0.0011	17000	5000	2.24 E-7
1.2029	0.0006	22000	5000	1.12 E-7
1.2029	0.0000	27000	5000	0.00 E+0
1.2029	0.0000	32000	5000	0.00 E+0
1.2046	0.0017	37000	5000	3.36 E-7
1.2048	0.0003	39000	2000	1.40 E-7
1.2054	0.0006	41000	2000	2.80 E-7
1.2068	0.0014	43000	2000	7.00 E-7
1.2082	0.0014	45000	2000	7.00 E-7
1.2088	0.0006	47000	2000	2.80 E-7
1.2096	0.0008	49000	2000	4.20 E-7
1.2110	0.0014	51000	2000	7.00 E-7
1.2141	0.0031	53000	2000	1.54 E-6
1.2160	0.0020	55000	2000	9.80 E-7
1.2183	0.0022	57000	2000	1.12 E-6
1.2211	0.0028	59000	2000	1.40 E-6
1.2239	0.0028	61000	2000	1.40 E-6
1.2270	0.0031	63000	2000	1.54 E-6
1.2303	0.0034	65000	2000	1.68 E-6
1.2354	0.0050	67000	2000	2.52 E-6
1.2398	0.0045	69000	2000	2.24 E-6
1.2449	0.0050	71000	2000	2.52 E-6
1.2499	0.0050	73000	2000	2.52 E-6
1.2544	0.0045	75000	2000	2.24 E-6
1.2589	0.0045	77000	2000	2.24 E-6
1.2639	0.0050	79000	2000	2.52 E-6

TABLE 32 (continued)

RUN NO. 2

1.2664	0.0025	80000	1000	2.52 E-6
1.2673	0.0008	85000	5000	1.68 E-7
1.2681	0.0008	90000	5000	1.68 E-7
1.2684	0.0003	95000	5000	5.60 E-8
1.2695	0.0011	100000	5000	2.24 E-7
1.2695	0.0000	105000	5000	0.00 E+0
1.2695	0.0000	110000	5000	0.00 E+0
1.2701	0.0006	115000	5000	1.12 E-7
1.2706	0.0006	117000	2000	2.80 E-7
1.2712	0.0006	119000	2000	2.80 E-7
1.2718	0.0006	121000	2000	2.80 E-7
1.2720	0.0003	123000	2000	1.40 E-7
1.2723	0.0003	125000	2000	1.40 E-7
1.2732	0.0008	127000	2000	4.20 E-7
1.2740	0.0008	129000	2000	4.20 E-7
1.2748	0.0008	131000	2000	4.20 E-7
1.2765	0.0017	133000	2000	8.40 E-7
1.2785	0.0020	135000	2000	9.80 E-7
1.2810	0.0025	137000	2000	1.26 E-6
1.2835	0.0025	139000	2000	1.26 E-6
1.2860	0.0025	141000	2000	1.26 E-6
1.2886	0.0025	143000	2000	1.26 E-6
1.2922	0.0036	145000	2000	1.82 E-6
1.2953	0.0031	147000	2000	1.54 E-6
1.2995	0.0042	149000	2000	2.10 E-6
1.3048	0.0053	151000	2000	2.66 E-6
1.3101	0.0053	153000	2000	2.66 E-6
1.3152	0.0050	155000	2000	2.52 E-6
1.3202	0.0050	157000	2000	2.52 E-6

TABLE 32 (continued)

RUN NO. 3

1.3782	0.0017	183000	1000	1.68 E-6
1.3796	0.0014	188000	5000	2.80 E-7
1.3801	0.0006	193000	5000	1.12 E-7
1.3807	0.0006	198000	5000	1.12 E-7
1.3812	0.0006	203000	5000	1.12 E-7
1.3818	0.0006	208000	5000	1.12 E-7
1.3826	0.0008	213000	5000	1.68 E-7
1.3829	0.0003	218000	5000	5.60 E-8
1.3832	0.0003	220000	2000	1.40 E-7
1.3838	0.0006	222000	2000	2.80 E-7
1.3840	0.0003	224000	2000	1.40 E-7
1.3849	0.0008	226000	2000	4.20 E-7
1.3854	0.0006	228000	2000	2.80 E-7
1.3860	0.0006	230000	2000	2.80 E-7
1.3868	0.0008	232000	2000	4.20 E-7
1.3882	0.0014	234000	2000	7.00 E-7
1.3919	0.0036	236000	2000	1.82 E-6
1.3936	0.0017	238000	2000	8.40 E-7
1.3966	0.0031	240000	2000	1.54 E-6
1.3994	0.0028	242000	2000	1.40 E-6
1.4034	0.0039	244000	2000	1.96 E-6
1.4056	0.0022	246000	2000	1.12 E-6
1.4084	0.0028	248000	2000	1.40 E-6
1.4132	0.0048	250000	2000	2.38 E-6
1.4174	0.0042	252000	2000	2.10 E-6
1.4218	0.0045	254000	2000	2.24 E-6
1.4263	0.0045	256000	2000	2.24 E-6
1.4297	0.0034	258000	2000	1.68 E-6
1.4350	0.0053	260000	2000	2.66 E-6

TABLE 32 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	2.15 E-6	0.0011	500
2	2.61 E-7	0.0028	3500
3	1.31 E-7	0.0038	8500
4	1.31 E-7	0.0044	13500
5	1.49 E-7	0.0051	18500
6	3.73 E-8	0.0056	23500
7	5.60 E-8	0.0058	28500
8	1.68 E-7	0.0064	33500
9	1.87 E-7	0.0070	37000
10	2.80 E-7	0.0075	39000
11	3.73 E-7	0.0081	41000
12	4.20 E-7	0.0089	43000
13	2.33 E-7	0.0096	45000
14	3.73 E-7	0.0102	47000
15	5.13 E-7	0.0111	49000
16	8.87 E-7	0.0125	51000
17	1.21 E-6	0.0146	53000
18	9.80 E-7	0.0168	55000
19	1.40 E-6	0.0191	57000
20	1.35 E-6	0.0219	59000
21	1.59 E-6	0.0248	61000
22	1.35 E-6	0.0278	63000
23	1.91 E-6	0.0310	65000
24	2.05 E-6	0.0350	67000
25	2.24 E-6	0.0393	69000
26	2.47 E-6	0.0440	71000
27	2.38 E-6	0.0489	73000
28	2.15 E-6	0.0534	75000
29	2.57 E-6	0.0581	77000

TABLE 32 (continued)

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0021	1000
2	0.0035	6000
3	0.0041	11000
4	0.0048	16000
5	0.0055	21000
6	0.0057	26000
7	0.0060	31000
8	0.0068	36000
9	0.0072	38000
10	0.0077	40000
11	0.0085	42000
12	0.0093	44000
13	0.0098	46000
14	0.0105	48000
15	0.0116	50000
16	0.0133	52000
17	0.0158	54000
18	0.0177	56000
19	0.0205	58000
20	0.0232	60000
21	0.0264	62000
22	0.0291	64000
23	0.0329	66000
24	0.0371	68000
25	0.0415	70000
26	0.0465	72000
27	0.0512	74000
28	0.0555	76000
29	0.0607	78000

TABLE 33  
EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
TEMPERATURE DESICCATED AIR  
SPECIMEN NO. 3-L-10, TENSION-TENSION  
F=12Hz,  $K_2=7.78$ , R=0.1, U=27, S=2.7

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.4008	0.0006	262500	1000	5.60 E-7
1.4011	0.0003	287500	25000	1.12 E-8
1.4014	0.0003	312500	25000	1.12 E-8
1.4017	0.0003	337500	25000	1.12 E-8
1.4022	0.0006	362500	25000	2.24 E-8
1.4028	0.0006	387500	25000	2.24 E-8
1.4056	0.0028	412500	25000	1.12 E-7
1.4162	0.0106	437500	25000	4.26 E-7
1.4364	0.0202	462500	25000	8.06 E-7

Test performed to zero-in on overload shut-off ratio. Test terminated prior to reaching  $(da/dN)_c$ .

TABLE 34

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 6-L-10, TENSION-TENSION  
 F=12Hz,  $K_2=7.78$ , R=0.1, U=28, S=2.8

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.4732	0.0028	107750	2000	1.40 E-6
0.4760	0.0028	132750	25000	1.12 E-7
0.4774	0.0014	157750	25000	5.60 E-8
0.4808	0.0034	182750	25000	1.34 E-7
0.5230	0.0423	207750	25000	1.69 E-6

Test performed to zero-in on overload shut-off ratio. Test terminated  
 prior to reaching  $(da/dN)_c$ .

TABLE 35

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 6-L-10, TENSION-TENSION  
 F=12Hz,  $K_2=7.78$ , R=0.1, U=29, S=2.9

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.6574	0.0034	6000	1000	3.36 E-6
0.6597	0.0022	31000	25000	8.96 E-8
0.6602	0.0006	56000	25000	2.24 E-8
0.6616	0.0014	81000	25000	5.60 E-8
0.6639	0.0022	106000	25000	8.96 E-8
0.6723	0.0084	118500	12500	6.72 E-7
0.6978	0.0255	131000	12500	2.04 E-6

Test performed to zero-in on overload shut-off ratio. Test terminated prior to reaching  $(da/dN)_c$ .



TABLE 36

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 3-L-10, TENSION-TENSION  
 $F=12\text{Hz}$ ,  $K_2=7.78$ ,  $R=0.1$ ,  $U=30$ ,  $S=3.0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.8523	0.0006	101000	1000	5.60 E-7
0.8529	0.0006	126000	25000	2.24 E-8
0.8529	0.0000	151000	25000	0.00 E+0
0.8529	0.0000	176000	25000	0.00 E+0
0.8529	0.0000	201000	25000	0.00 E+0
0.8529	0.0000	226000	25000	0.00 E+0
0.8529	0.0000	251000	25000	0.00 E+0
0.8529	0.0000	276000	25000	0.00 E+0
0.8529	0.0000	301000	25000	0.00 E+0
0.8529	0.0000	326000	25000	0.00 E+0
0.8532	0.0003	351000	25000	1.12 E-8
0.8532	0.0000	376000	25000	0.00 E+0
0.8532	0.0000	401000	25000	0.00 E+0
0.8532	0.0000	426000	25000	0.00 E+0
0.8532	0.0000	451000	25000	0.00 E+0
0.8532	0.0000	476000	25000	0.00 E+0
0.8532	0.0000	501000	25000	0.00 E+0
0.8534	0.0003	526000	25000	1.12 E-8
0.8534	0.0000	551000	25000	0.00 E+0
0.8534	0.0000	576000	25000	0.00 E+0
0.8534	0.0000	601000	25000	0.00 E+0
0.8534	0.0000	626000	25000	0.00 E+0
0.8534	0.0000	651000	25000	0.00 E+0
0.8534	0.0000	676000	25000	0.00 E+0
0.8534	0.0000	701000	25000	0.00 E+0
0.8534	0.0000	726000	25000	0.00 E+0
0.8534	0.0000	751000	25000	0.00 E+0
0.8534	0.0000	776000	25000	0.00 E+0
0.8534	0.0000	801000	25000	0.00 E+0

$S=3.0$  considered to be overload shut-off ratio for this case.

TABLE 37

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 6-L-20, TENSION-TENSION  
 F=12Hz, K2=14, R=0.5, U=3.0, S=1.5

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.0402	0.0022	13000	1000	2.24 E-6
1.0422	0.0020	14000	1000	1.96 E-6
1.0433	0.0011	15000	1000	1.12 E-6
1.0438	0.0006	16000	1000	5.60 E-7
1.0472	0.0034	17000	1000	3.36 E-6
1.0494	0.0022	18000	1000	2.24 E-6
1.0536	0.0042	19000	1000	4.20 E-6
1.0578	0.0042	20000	1000	4.20 E-6
1.0620	0.0042	21000	1000	4.20 E-6
1.0665	0.0045	22000	1000	4.48 E-6
1.0710	0.0045	23000	1000	4.48 E-6
1.0760	0.0050	24000	1000	5.04 E-6
1.0802	0.0042	25000	1000	4.20 E-6
RUN NO. 2				
1.0822	0.0020	26000	1000	1.96 E-6
1.0830	0.0008	27000	1000	8.40 E-7
1.0844	0.0014	28000	1000	1.40 E-6
1.0867	0.0022	29000	1000	2.24 E-6
1.0884	0.0017	30000	1000	1.68 E-6
1.0912	0.0028	31000	1000	2.80 E-6
1.0942	0.0031	32000	1000	3.08 E-6
1.0984	0.0042	33000	1000	4.20 E-6
1.1021	0.0036	34000	1000	3.64 E-6
1.1060	0.0039	35000	1000	3.92 E-6
1.1108	0.0048	36000	1000	4.76 E-6
1.1150	0.0042	37000	1000	4.20 E-6
1.1197	0.0048	38000	1000	4.76 E-6
RUN NO. 3				
1.1222	0.0025	39000	1000	2.52 E-6
1.1236	0.0014	40000	1000	1.40 E-6
1.1242	0.0006	41000	1000	5.60 E-7
1.1259	0.0017	42000	1000	1.68 E-6
1.1273	0.0014	43000	1000	1.40 E-6
1.1312	0.0039	44000	1000	3.92 E-6
1.1346	0.0034	45000	1000	3.36 E-6
1.1376	0.0031	46000	1000	3.08 E-6
1.1432	0.0056	47000	1000	5.60 E-6
1.1477	0.0045	48000	1000	4.48 E-6
1.1519	0.0042	49000	1000	4.20 E-6
1.1561	0.0042	50000	1000	4.20 E-6
1.1603	0.0042	(109) 51000	1000	4.20 E-6

TABLE 37 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	2.24 E-6	0.0011	500
2	1.40 E-6	0.0029	1500
3	1.03 E-6	0.0042	2500
4	1.49 E-6	0.0054	3500
5	2.15 E-6	0.0072	4500
6	2.99 E-6	0.0098	5500
7	3.55 E-6	0.0131	6500
8	3.83 E-6	0.0168	7500
9	4.48 E-6	0.0209	8500
10	4.29 E-6	0.0253	9500
11	4.48 E-6	0.0297	10500
12	4.48 E-6	0.0342	11500
13	4.39 E-6	0.0386	12500

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0022	1000
2	0.0036	2000
3	0.0047	3000
4	0.0062	4000
5	0.0083	5000
6	0.0113	6000
7	0.0143	7000
8	0.0187	8000
9	0.0231	9000
10	0.0274	10000
11	0.0319	11000
12	0.0364	12000
13	0.0408	13000

TABLE 38

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 2-L-9, TENSION-TENSION  
 F=12Hz,  $K_2=14$ , R=0.5, U=4.0, S=2.0

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.0136	0.0034	161500	1000	3.36 E-6
1.0156	0.0020	169500	8000	2.45 E-7
1.0172	0.0017	177500	8000	2.10 E-7
1.0175	0.0003	185500	8000	3.50 E-8
1.0181	0.0006	189500	4000	1.40 E-7
1.0186	0.0006	193500	4000	1.40 E-7
1.0186	0.0000	197500	4000	0.00 E+0
1.0195	0.0008	199500	2000	4.20 E-7
1.0195	0.0000	201500	2000	0.00 E+0
1.0195	0.0000	203500	2000	0.00 E+0
1.0200	0.0006	204500	1000	5.60 E-7
1.0200	0.0000	205500	1000	0.00 E+0
1.0200	0.0000	206500	1000	0.00 E+0
1.0203	0.0003	207500	1000	2.80 E-7
1.0203	0.0000	208500	1000	0.00 E+0
1.0203	0.0000	209500	1000	0.00 E+0
1.0209	0.0006	210500	1000	5.60 E-7
1.0214	0.0006	211500	1000	5.60 E-7
1.0223	0.0008	212500	1000	8.40 E-7
1.0242	0.0020	213500	1000	1.96 E-6
1.0259	0.0017	214500	1000	1.63 E-6
1.0282	0.0022	215500	1000	2.24 E-6
1.0321	0.0039	216500	1000	3.92 E-6
1.0363	0.0042	217500	1000	4.20 E-6
1.0413	0.0050	218500	1000	5.04 E-6
1.0458	0.0045	219500	1000	4.48 E-6
1.0503	0.0045	220500	1000	4.48 E-6
1.0542	0.0039	221500	1000	3.92 E-6

TABLE 38 (continued)

RUN NO. 2

1.1455	0.0017	242500	1000	1.68 E-6
1.1466	0.0011	250500	8000	1.40 E-7
1.1474	0.0008	258500	8000	1.05 E-7
1.1483	0.0008	266500	8000	1.05 E-7
1.1483	0.0000	270500	4000	0.00 E+0
1.1488	0.0006	274500	4000	1.40 E-7
1.1500	0.0011	278500	4000	2.80 E-7
1.1514	0.0014	280500	2000	7.00 E-7
1.1519	0.0006	282500	2000	2.80 E-7
1.1528	0.0008	284500	2000	4.20 E-7
1.1530	0.0003	285500	1000	2.80 E-7
1.1536	0.0006	286500	1000	5.60 E-7
1.1547	0.0011	287500	1000	1.12 E-6
1.1558	0.0011	288500	1000	1.12 E-6
1.1575	0.0017	289500	1000	1.68 E-6
1.1592	0.0017	290500	1000	1.68 E-6
1.1631	0.0039	291500	1000	3.92 E-6
1.1665	0.0034	292500	1000	3.36 E-6
1.1698	0.0034	293500	1000	3.36 E-6
1.1746	0.0048	294500	1000	4.76 E-6
1.1794	0.0048	295500	1000	4.76 E-6
1.1836	0.0042	296500	1000	4.20 E-6
1.1889	0.0053	297500	1000	5.32 E-6
1.1934	0.0045	298500	1000	4.48 E-6
1.1978	0.0045	299500	1000	4.48 E-6
1.2015	0.0036	300500	1000	3.64 E-6
1.2071	0.0056	301500	1000	5.60 E-6
1.2113	0.0042	302500	1000	4.20 E-6

TABLE 38 (continued)

RUN NO. 3

1.2874	0.0025	320750	1000	2.52 E-6
1.2900	0.0025	323750	8000	3.15 E-7
1.2914	0.0014	336750	8000	1.75 E-7
1.2925	0.0011	344750	8000	1.40 E-7
1.2930	0.0006	348750	4000	1.40 E-7
1.2930	0.0000	352750	4000	0.00 E+0
1.2936	0.0006	356750	4000	1.40 E-7
1.2939	0.0003	358750	2000	1.40 E-7
1.2939	0.0000	360750	2000	0.00 E+0
1.2944	0.0006	362750	2000	2.80 E-7
1.2947	0.0003	363750	1000	2.80 E-7
1.2950	0.0003	364750	1000	2.80 E-7
1.2956	0.0006	365750	1000	5.60 E-7
1.2961	0.0006	366750	1000	5.60 E-7
1.2967	0.0006	367750	1000	5.60 E-7
1.2978	0.0011	368750	1000	1.12 E-6
1.2992	0.0014	369750	1000	1.40 E-6
1.3026	0.0034	370750	1000	3.36 E-6
1.3051	0.0025	371750	1000	2.52 E-6
1.3090	0.0039	372750	1000	3.92 E-6
1.3138	0.0048	373750	1000	4.76 E-6
1.3185	0.0048	374750	1000	4.76 E-6
1.3238	0.0053	375750	1000	5.32 E-6
1.3286	0.0048	376750	1000	4.76 E-6
1.3328	0.0042	377750	1000	4.20 E-6
1.3370	0.0042	378750	1000	4.20 E-6
1.3423	0.0053	379750	1000	5.32 E-6
1.3465	0.0042	380750	1000	4.20 E-6

TABLE 38 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR. #	DA/DN	TOT CRACK	TOT CYCLES
1	2.52 E-6	0.0013	500
2	2.33 E-7	0.0035	5000
3	1.63 E-7	0.0050	13000
4	9.33 E-8	0.0061	21000
5	9.33 E-8	0.0066	27000
6	9.33 E-8	0.0070	31000
7	1.40 E-7	0.0075	35000
8	4.20 E-7	0.0082	38000
9	9.33 E-8	0.0087	40000
10	2.33 E-7	0.0090	42000
11	3.73 E-7	0.0094	43500
12	2.80 E-7	0.0098	44500
13	5.60 E-7	0.0102	45500
14	6.53 E-7	0.0108	46500
15	7.47 E-7	0.0115	47500
16	9.33 E-7	0.0123	48500
17	1.96 E-6	0.0138	49500
18	2.43 E-6	0.0160	50500
19	2.24 E-6	0.0183	51500
20	3.55 E-6	0.0212	52500
21	3.73 E-6	0.0248	53500
22	3.73 E-6	0.0286	54500
23	4.85 E-6	0.0329	55500
24	4.48 E-6	0.0375	56500
25	4.57 E-6	0.0420	57500
26	4.11 E-6	0.0464	58500
27	5.13 E-6	0.0510	59500
28	4.11 E-6	0.0556	60500

TABLE 38 (continued)

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0025	1000
2	0.0044	9000
3	0.0057	17000
4	0.0064	25000
5	0.0068	29000
6	0.0072	33000
7	0.0077	37000
8	0.0086	39000
9	0.0088	41000
10	0.0092	43000
11	0.0096	44000
12	0.0099	45000
13	0.0105	46000
14	0.0111	47000
15	0.0119	48000
16	0.0128	49000
17	0.0147	50000
18	0.0172	51000
19	0.0194	52000
20	0.0230	53000
21	0.0267	54000
22	0.0304	55000
23	0.0353	56000
24	0.0398	57000
25	0.0443	58000
26	0.0484	59000
27	0.0536	60000
28	0.0577	61000



TABLE 39

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 5-L-6, TENSION-TENSION  
 F=12Hz,  $K_2=14$ , R=0.5, U=5, S=2.5

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.8077	0.0028	1000	1000	2.80 E-6
1.8077	0.0000	26000	25000	0.00 E+0
1.8088	0.0011	51000	25000	4.48 E-8
1.8096	0.0008	76000	25000	3.36 E-8
1.8105	0.0008	101000	25000	3.36 E-8
1.8105	0.0000	126000	25000	0.00 E+0
1.8105	0.0000	151000	25000	0.00 E+0
1.8105	0.0000	176000	25000	0.00 E+0
1.8105	0.0000	201000	25000	0.00 E+0
1.8105	0.0000	226000	25000	0.00 E+0
1.8105	0.0000	251000	25000	0.00 E+0
1.8108	0.0003	276000	25000	1.12 E-8
1.8108	0.0000	301000	25000	0.00 E+0
1.8108	0.0000	326000	25000	0.00 E+0
1.8108	0.0000	351000	25000	0.00 E+0
1.8108	0.0000	376000	25000	0.00 E+0
1.8108	0.0000	401000	25000	0.00 E+0
1.8108	0.0000	426000	25000	0.00 E+0
1.8108	0.0000	451000	25000	0.00 E+0
1.8108	0.0000	476000	25000	0.00 E+0
1.8108	0.0000	501000	25000	0.00 E+0
1.8108	0.0000	526000	25000	0.00 E+0
1.8108	0.0000	551000	25000	0.00 E+0
1.8108	0.0000	576000	25000	0.00 E+0
1.8110	0.0003	601000	25000	1.12 E-8
1.8110	0.0000	626000	25000	0.00 E+0
1.8110	0.0000	651000	25000	0.00 E+0
1.8110	0.0000	676000	25000	0.00 E+0
1.8110	0.0000	701000	25000	0.00 E+0

Both crack tips shut-off.

TABLE 40

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 3-L-10, TENSION-TENSION  
 $F=12\text{Hz}$ ,  $K_2=14$ ,  $R=0.5$ ,  $U=4.4$ ,  $S=2.2$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.4726	0.0008	5000	1000	8.40 E-7
0.4726	0.0000	30000	25000	0.00 E+0
0.4726	0.0000	55000	25000	0.00 E+0
0.4726	0.0000	80000	25000	0.00 E+0
0.4726	0.0000	105000	25000	0.00 E+0
0.4726	0.0000	130000	25000	0.00 E+0
0.4738	0.0011	155000	25000	4.48 E-8
0.4962	0.0224	168750	13750	1.63 E-6

Test performed to zero-in on overload shut-off ratio. Test terminated prior to reaching  $(da/dN)_c$ .

TABLE 41

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 3-L-10, TENSION-TENSION  
 F=12Hz,  $K_2=14$ , R=0.5, U=4.6, S=2.3

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.5947	0.0017	6000	1000	1.68 E-6
0.5947	0.0000	31000	25000	0.00 E+0
0.5947	0.0000	56000	25000	0.00 E+0
0.5947	0.0000	81000	25000	0.00 E+0
0.5947	0.0000	106000	25000	0.00 E+0
0.5947	0.0000	131000	25000	0.00 E+0
0.5947	0.0000	156000	25000	0.00 E+0
0.5947	0.0000	181000	25000	0.00 E+0
0.5947	0.0000	206000	25000	0.00 E+0
0.5947	0.0000	231000	25000	0.00 E+0
0.5947	0.0000	256000	25000	0.00 E+0
0.5947	0.0000	281000	25000	0.00 E+0
0.5947	0.0000	306000	25000	0.00 E+0
0.5947	0.0000	331000	25000	0.00 E+0
0.5953	0.0006	356000	25000	2.24 E-8
0.5956	0.0003	381000	25000	1.12 E-8
0.5956	0.0000	406000	25000	0.00 E+0
0.5958	0.0003	431000	25000	1.12 E-8
0.5958	0.0000	456000	25000	0.00 E+0
0.5958	0.0000	481000	25000	0.00 E+0
0.5958	0.0000	506000	25000	0.00 E+0
0.5958	0.0000	531000	25000	0.00 E+0
0.5958	0.0000	556000	25000	0.00 E+0
0.5958	0.0000	581000	25000	0.00 E+0
0.5958	0.0000	606000	25000	0.00 E+0
0.5958	0.0000	631000	25000	0.00 E+0
0.5958	0.0000	656000	25000	0.00 E+0
0.5958	0.0000	681000	25000	0.00 E+0
0.5958	0.0000	706000	25000	0.00 E+0

S=2.3 considered to be overload shut-off ratio for this case.

Data Tabulations for Tension-Zero Load Class,  
 $K_2 = 10 \text{ KSI } \sqrt{\text{In.}}$

TABLE 42

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 3-L-13, TENSION-ZERO  
 $F=12\text{Hz}$ ,  $K2=10$ ,  $R=0.3$ ,  $1/U=0$ ,  $S=1.0$

## RUN NO. 1

0.5040	0.0034	6000	1000	3.36 E-6
0.5062	0.0022	7000	1000	2.24 E-6
0.5107	0.0045	8000	1000	4.48 E-6
0.5141	0.0034	9000	1000	3.36 E-6
0.5163	0.0022	10000	1000	2.24 E-6
0.5197	0.0034	11000	1000	3.36 E-6
0.5225	0.0028	12000	1000	2.80 E-6
0.5258	0.0034	13000	1000	3.36 E-6

## RUN NO. 2

0.5292	0.0034	14000	1000	3.36 E-6
0.5326	0.0034	15000	1000	3.36 E-6
0.5359	0.0034	16000	1000	3.36 E-6
0.5393	0.0034	17000	1000	3.36 E-6
0.5415	0.0022	18000	1000	2.24 E-6
0.5449	0.0034	19000	1000	3.36 E-6
0.5488	0.0039	20000	1000	3.92 E-6
0.5522	0.0034	21000	1000	3.36 E-6

## RUN NO. 3

0.5555	0.0034	22000	1000	3.36 E-6
0.5589	0.0034	23000	1000	3.36 E-6
0.5611	0.0022	24000	1000	2.24 E-6
0.5650	0.0039	25000	1000	3.92 E-6
0.5695	0.0045	26000	1000	4.48 E-6
0.5718	0.0022	27000	1000	2.24 E-6
0.5751	0.0034	28000	1000	3.36 E-6
0.5790	0.0039	29000	1000	3.92 E-6

## RUN NO. 4

0.5824	0.0034	30000	1000	3.36 E-6
0.5852	0.0028	31000	1000	2.80 E-6
0.5874	0.0022	32000	1000	2.24 E-6
0.5914	0.0039	33000	1000	3.92 E-6
0.5936	0.0022	34000	1000	2.24 E-6
0.5981	0.0045	35000	1000	4.48 E-6
0.6009	0.0028	36000	1000	2.80 E-6
0.6037	0.0028	37000	1000	2.80 E-6

TABLE 42 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	3.36 E-6	0.0017	500
2	2.94 E-6	0.0048	1500
3	3.08 E-6	0.0078	2500
4	3.64 E-6	0.0112	3500
5	2.80 E-6	0.0144	4500
6	3.36 E-6	0.0175	5500
7	3.22 E-6	0.0208	6500
8	3.36 E-6	0.0241	7500

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0034	1000
2	0.0063	2000
3	0.0094	3000
4	0.0130	4000
5	0.0158	5000
6	0.0192	6000
7	0.0224	7000
8	0.0258	8000

TABLE 43

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM

TEMPERATURE DESICCATED AIR

SPECIMEN 2-I-10, TENSION - ZERO

F=12Hz, K2=10, R=0.5, 1/U=0 S=1.0

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.3664	0.0022	16000	2000	1.12 E-6
1.3709	0.0045	18000	2000	2.24 E-6
1.3737	0.0028	20000	2000	1.40 E-6
1.3765	0.0028	22000	2000	1.40 E-6
1.3787	0.0022	24000	2000	1.12 E-6
1.3819	0.0022	26000	2000	1.12 E-6
1.3832	0.0022	28000	2000	1.12 E-6
RUN NO. 2				
1.3854	0.0022	30000	2000	1.12 E-6
1.3871	0.0017	32000	2000	3.40 E-7
1.3899	0.0028	34000	2000	1.40 E-6
1.3922	0.0022	36000	2000	1.12 E-6
1.3944	0.0022	38000	2000	1.12 E-6
1.3966	0.0022	40000	2000	1.12 E-6
1.3989	0.0022	42000	2000	1.12 E-6
RUN NO. 3				
1.4017	0.0028	44000	2000	1.40 E-6
1.4045	0.0028	46000	2000	1.40 E-6
1.4067	0.0022	48000	2000	1.12 E-6
1.4095	0.0028	50000	2000	1.40 E-6
1.4118	0.0022	52000	2000	1.12 E-6
1.4146	0.0028	54000	2000	1.40 E-6
1.4174	0.0028	56000	2000	1.40 E-6
RUN NO. 4				
1.4207	0.0034	58000	2000	1.68 E-6
1.4213	0.0036	60000	2000	2.80 E-7
1.4246	0.0034	62000	2000	1.63 E-6
1.4274	0.0028	64000	2000	1.40 E-6
1.4297	0.0022	66000	2000	1.12 E-6
1.4319	0.0022	68000	2000	1.12 E-6
1.4347	0.0023	70000	2000	1.40 E-6

TABLE 43 (continued)

## RUN NO. 5

1.4375	0.0028	72000	2000	1.40 E-6
1.4398	0.0022	74000	2000	1.12 E-6
1.4414	0.0017	76000	2000	8.40 E-7
1.4431	0.0017	78000	2000	8.40 E-7
1.4459	0.0023	80000	2000	1.40 E-6
1.4487	0.0028	82000	2000	1.40 E-6
1.4510	0.0022	84000	2000	1.12 E-6

## RUN NO. 6

1.4521	0.0011	86000	2000	5.60 E-7
1.4549	0.0028	88000	2000	1.40 E-6
1.4566	0.0017	90000	2000	8.40 E-7
1.4594	0.0028	92000	2000	1.40 E-6
1.4616	0.0022	94000	2000	1.12 E-6
1.4633	0.0017	96000	2000	8.40 E-7
1.4650	0.0017	98000	2000	8.40 E-7

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	1.21 E-6	0.0012	1000
2	1.21 E-6	0.0036	3000
3	1.21 E-6	0.0061	5000
4	1.26 E-6	0.0085	7000
5	1.17 E-6	0.0110	9000
6	1.17 E-6	0.0133	11000
7	1.17 E-6	0.0156	13000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0024	2000
2	0.0049	4000
3	0.0073	6000
4	0.0098	8000
5	0.0121	10000
6	0.0145	12000
7	0.0168	14000



TABLE 44

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 6-L-7, TENSION-ZERO  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.1$ ,  $1/U=0$ ,  $S=1.5$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.3630	0.0039	17000	1000	3.92 E-6
1.3658	0.0028	18000	1000	2.80 E-6
1.3686	0.0028	19000	1000	2.80 E-6
1.3726	0.0039	20000	1000	3.92 E-6
1.3765	0.0039	21000	1000	3.92 E-6
1.3810	0.0045	22000	1000	4.48 E-6
1.3860	0.0050	23000	1000	5.04 E-6
1.3899	0.0039	24000	1000	3.92 E-6
1.3944	0.0045	25000	1000	4.48 E-6
1.3989	0.0045	26000	1000	4.48 E-6
RUN NO. 2				
1.4028	0.0039	27000	1000	3.92 E-6
1.4050	0.0022	28000	1000	2.24 E-6
1.4084	0.0034	29000	1000	3.36 E-6
1.4118	0.0034	30000	1000	3.36 E-6
1.4162	0.0045	31000	1000	4.48 E-6
1.4202	0.0039	32000	1000	3.92 E-6
1.4246	0.0045	33000	1000	4.48 E-6
1.4286	0.0039	34000	1000	3.92 E-6
1.4330	0.0045	35000	1000	4.48 E-6
1.4364	0.0034	36000	1000	3.36 E-6
RUN NO. 3				
1.4409	0.0045	37000	1000	4.48 E-6
1.4431	0.0022	38000	1000	2.24 E-6
1.4459	0.0028	39000	1000	2.80 E-6
1.4493	0.0034	40000	1000	3.36 E-6
1.4526	0.0034	41000	1000	3.36 E-6
1.4566	0.0039	42000	1000	3.92 E-6
1.4622	0.0056	43000	1000	5.60 E-6
1.4672	0.0050	44000	1000	5.04 E-6
1.4728	0.0056	45000	1000	5.60 E-6
1.4767	0.0039	46000	1000	3.92 E-6

TABLE 44 (continued)

RUN NO. 4

1.4806	0.0039	47000	1000	3.92 E-6
1.4829	0.0022	48000	1000	2.24 E-6
1.4862	0.0034	49000	1000	3.36 E-6
1.4896	0.0034	50000	1000	3.36 E-6
1.4952	0.0056	51000	1000	5.60 E-6
1.4991	0.0039	52000	1000	3.92 E-6
1.5042	0.0050	53000	1000	5.04 E-6
1.5092	0.0050	54000	1000	5.04 E-6
1.5131	0.0039	55000	1000	3.92 E-6
1.5176	0.0045	56000	1000	4.48 E-6

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	4.06 E-6	0.0020	500
2	2.38 E-6	0.0052	1500
3	3.08 E-6	0.0080	2500
4	3.50 E-6	0.0113	3500
5	4.34 E-6	0.0152	4500
6	4.06 E-6	0.0194	5500
7	5.04 E-6	0.0239	6500
8	4.48 E-6	0.0287	7500
9	4.62 E-6	0.0333	8500
10	4.06 E-6	0.0376	9500

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0041	1000
2	0.0064	2000
3	0.0095	3000
4	0.0130	4000
5	0.0174	5000
6	0.0214	6000
7	0.0265	7000
8	0.0309	8000
9	0.0356	9000
10	0.0396	10000

TABLE 45

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 3-L-13, TENSION-ZERO  
 F=12Hz, K2=10, R=0.3, 1/U=0, S=1.5

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.6653	0.0034	17000	1000	3.36 E-6
0.6664	0.0011	18000	1000	1.12 E-6
0.6681	0.0017	19000	1000	1.68 E-6
0.6703	0.0022	20000	1000	2.24 E-6
0.6737	0.0034	21000	1000	3.36 E-6
0.6776	0.0039	22000	1000	3.92 E-6
0.6804	0.0028	23000	1000	2.80 E-6
0.6843	0.0039	24000	1000	3.92 E-6
0.6877	0.0034	25000	1000	3.36 E-6
0.6910	0.0034	26000	1000	3.36 E-6
RUN NO. 2				
0.6927	0.0017	27000	1000	1.68 E-6
0.6950	0.0022	28000	1000	2.24 E-6
0.6978	0.0028	29000	1000	2.80 E-6
0.7000	0.0022	30000	1000	2.24 E-6
0.7022	0.0022	31000	1000	2.24 E-6
0.7045	0.0022	32000	1000	2.24 E-6
0.7084	0.0039	33000	1000	3.92 E-6
0.7123	0.0039	34000	1000	3.92 E-6
0.7162	0.0039	35000	1000	3.92 E-6
0.7190	0.0028	36000	1000	2.80 E-6
RUN NO. 3				
0.7224	0.0034	37000	1000	3.36 E-6
0.7241	0.0017	38000	1000	1.68 E-6
0.7263	0.0022	39000	1000	2.24 E-6
0.7286	0.0022	40000	1000	2.24 E-6
0.7302	0.0017	41000	1000	1.68 E-6
0.7342	0.0039	42000	1000	3.92 E-6
0.7358	0.0017	43000	1000	1.68 E-6
0.7398	0.0039	44000	1000	3.92 E-6
0.7426	0.0028	45000	1000	2.80 E-6
0.7465	0.0039	46000	1000	3.92 E-6

TABLE 45 (continued)

## RUN NO. 4

0.7532	0.0034	48000	1000	3.36 E-6
0.7538	0.0006	49000	1000	5.60 E-7
0.7560	0.0022	50000	1000	2.24 E-6
0.7577	0.0017	51000	1000	1.68 E-6
0.7610	0.0034	52000	1000	3.36 E-6
0.7638	0.0028	53000	1000	2.80 E-6
0.7672	0.0034	54000	1000	3.36 E-6
0.7711	0.0039	55000	1000	3.92 E-6
0.7745	0.0034	56000	1000	3.36 E-6
0.7773	0.0028	57000	1000	2.80 E-6

## RUN NO. 5

0.7795	0.0022	58000	1000	2.24 E-6
0.7818	0.0022	59000	1000	2.24 E-6
0.7834	0.0017	60000	1000	1.68 E-6
0.7851	0.0017	61000	1000	1.68 E-6
0.7874	0.0022	62000	1000	2.24 E-6
0.7918	0.0045	63000	1000	4.48 E-6
0.7946	0.0028	64000	1000	2.80 E-6
0.7974	0.0028	65000	1000	2.80 E-6
0.8014	0.0039	66000	1000	3.92 E-6
0.8042	0.0028	67000	1000	2.80 E-6

## RUN NO. 6

0.8075	0.0034	68000	1000	3.36 E-6
0.8114	0.0039	69000	1000	3.92 E-6
0.8137	0.0022	70000	1000	2.24 E-6
0.8165	0.0028	71000	1000	2.80 E-6
0.8193	0.0028	72000	1000	2.80 E-6
0.8215	0.0022	73000	1000	2.24 E-6
0.8243	0.0028	74000	1000	2.80 E-6
0.8288	0.0045	75000	1000	4.48 E-6
0.8322	0.0034	76000	1000	3.36 E-6
0.8350	0.0028	77000	1000	2.80 E-6

TABLE 45 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	2.89 E-6	0.0014	500
2	1.96 E-6	0.0039	1500
3	2.15 E-6	0.0059	2500
4	2.15 E-6	0.0081	3500
5	2.61 E-6	0.0105	4500
6	3.27 E-6	0.0134	5500
7	2.89 E-6	0.0165	6500
8	3.83 E-6	0.0198	7500
9	3.45 E-6	0.0235	8500
10	3.08 E-6	0.0267	9500

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0029	1000
2	0.0049	2000
3	0.0070	3000
4	0.0091	4000
5	0.0118	5000
6	0.0150	6000
7	0.0179	7000
8	0.0217	8000
9	0.0252	9000
10	0.0283	10000

TABLE 46

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
TEMPERATURE DESICCATED AIR

SPECIMEN NO. 6-L-7, TENSION-ZERO  
F=12Hz, K2=10, R=0.5, 1/U=0, S=1.5

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.2253	0.0017	13000	1000	1.68 E-6
1.2258	0.0006	15000	2000	2.80 E-7
1.2275	0.0017	17000	2000	8.40 E-7
1.2292	0.0017	19000	2000	8.40 E-7
1.2314	0.0022	21000	2000	1.12 E-6
1.2337	0.0022	23000	2000	1.12 E-6
1.2376	0.0039	25000	2000	1.96 E-6
1.2393	0.0017	27000	2000	8.40 E-7
1.2421	0.0028	29000	2000	1.40 E-6
1.2449	0.0028	31000	2000	1.40 E-6
1.2471	0.0022	33000	2000	1.12 E-6
RUN NO. 2				
1.2477	0.0006	34000	1000	5.60 E-7
1.2488	0.0011	36000	2000	5.60 E-7
1.2516	0.0028	38000	2000	1.40 E-6
1.2533	0.0017	40000	2000	8.40 E-7
1.2550	0.0017	42000	2000	8.40 E-7
1.2578	0.0028	44000	2000	1.40 E-6
1.2606	0.0028	46000	2000	1.40 E-6
1.2628	0.0022	48000	2000	1.12 E-6
1.2656	0.0028	50000	2000	1.40 E-6
1.2684	0.0028	52000	2000	1.40 E-6
1.2706	0.0022	54000	2000	1.12 E-6
RUN NO. 3				
1.2718	0.0011	55000	1000	1.12 E-6
1.2718	0.0000	57000	2000	0.00 E+0
1.2734	0.0017	59000	2000	8.40 E-7
1.2762	0.0028	61000	2000	1.40 E-6
1.2785	0.0022	63000	2000	1.12 E-6
1.2807	0.0022	65000	2000	1.12 E-6
1.2830	0.0022	67000	2000	1.12 E-6
1.2858	0.0028	69000	2000	1.40 E-6
1.2886	0.0028	71000	2000	1.40 E-6
1.2914	0.0028	73000	2000	1.40 E-6
1.2930	0.0017	75000	2000	8.40 E-7

TABLE 46 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	1.12 E-6	0.0006	500
2	2.80 E-7	0.0014	2000
3	1.03 E-6	0.0027	4000
4	1.03 E-6	0.0048	6000
5	1.03 E-6	0.0068	8000
6	1.21 E-6	0.0091	10000
7	1.49 E-6	0.0118	12000
8	1.12 E-6	0.0144	14000
9	1.40 E-6	0.0169	16000
10	1.40 E-6	0.0197	18000
11	1.03 E-6	0.0221	20000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0011	1000
2	0.0017	3000
3	0.0037	5000
4	0.0058	7000
5	0.0078	9000
6	0.0103	11000
7	0.0133	13000
8	0.0155	15000
9	0.0183	17000
10	0.0211	19000
11	0.0231	21000

TABLE 47

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 6-L-7, TENSION-ZERO  
 F=12Hz, K2=10, R=0.1, 1/U=0, S=2

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.7370	0.0039	27000	1000	3.92 E-6
0.7386	0.0017	29000	2000	8.40 E-7
0.7409	0.0022	31000	2000	1.12 E-6
0.7426	0.0017	33000	2000	8.40 E-7
0.7459	0.0034	35000	2000	1.68 E-6
0.7515	0.0056	37000	2000	2.80 E-6
0.7582	0.0067	39000	2000	3.36 E-6
0.7661	0.0078	41000	2000	3.92 E-6
0.7756	0.0095	43000	2000	4.76 E-6
0.7851	0.0095	45000	2000	4.76 E-6
0.7952	0.0101	47000	2000	5.04 E-6
0.8064	0.0112	49000	2000	5.60 E-6
0.8154	0.0090	51000	2000	4.48 E-6
0.8260	0.0106	53000	2000	5.32 E-6
0.8355	0.0095	55000	2000	4.76 E-6
RUN NO. 2				
0.8400	0.0045	56000	1000	4.48 E-6
0.8428	0.0028	58000	2000	1.40 E-6
0.8445	0.0017	60000	2000	8.40 E-7
0.8462	0.0017	62000	2000	8.40 E-7
0.8495	0.0034	64000	2000	1.68 E-6
0.8534	0.0039	66000	2000	1.96 E-6
0.8607	0.0073	68000	2000	3.64 E-6
0.8702	0.0095	70000	2000	4.76 E-6
0.8814	0.0112	72000	2000	5.60 E-6
0.8926	0.0112	74000	2000	5.60 E-6
0.9027	0.0101	76000	2000	5.04 E-6
0.9128	0.0101	78000	2000	5.04 E-6
0.9240	0.0112	80000	2000	5.60 E-6
0.9346	0.0106	82000	2000	5.32 E-6
0.9453	0.0106	84000	2000	5.32 E-6



TABLE 47 (continued)

RUN NO. 3

0.9498	0.0045	85000	1000	4.48 E-6
0.9520	0.0022	87000	2000	1.12 E-6
0.9531	0.0011	89000	2000	5.60 E-7
0.9559	0.0028	91000	2000	1.40 E-6
0.9593	0.0034	93000	2000	1.68 E-6
0.9638	0.0045	95000	2000	2.24 E-6
0.9705	0.0067	97000	2000	3.36 E-6
0.9766	0.0062	99000	2000	3.08 E-6
0.9862	0.0095	101000	2000	4.76 E-6
0.9957	0.0095	103000	2000	4.76 E-6
1.0046	0.0090	105000	2000	4.48 E-6
1.0130	0.0084	107000	2000	4.20 E-6
1.0231	0.0101	109000	2000	5.04 E-6
1.0332	0.0101	111000	2000	5.04 E-6
1.0416	0.0084	113000	2000	4.20 E-6

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	4.29 E-6	0.0021	500
2	1.12 E-6	0.0054	2000
3	8.40 E-7	0.0074	4000
4	1.03 E-6	0.0092	6000
5	1.68 E-6	0.0119	8000
6	2.33 E-6	0.0160	10000
7	3.45 E-6	0.0217	12000
8	3.92 E-6	0.0291	14000
9	5.04 E-6	0.0381	16000
10	5.04 E-6	0.0482	18000
11	4.85 E-6	0.0581	20000
12	4.95 E-6	0.0679	22000
13	5.04 E-6	0.0778	24000
14	5.23 E-6	0.0881	26000
15	4.76 E-6	0.0981	28000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0043	1000
2	0.0065	3000
3	0.0082	5000
4	0.0103	7000
5	0.0136	9000
6	0.0183	11000
7	0.0252	13000
8	0.0330	15000
9	0.0431	17000
10	0.0532	19000
11	0.0629	21000
12	0.0728	23000
13	0.0829	25000
14	0.0933	27000
15	0.1029	29000

(132)

TABLE 48  
EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
TEMPERATURE DESICCATED AIR  
SPECIMEN NO. 6-L-7, TENSION-ZERO  
F=12Hz, K2=10, R=0.3, 1/U=0, S=2.0

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.4693	0.0022	17000	1000	2.24 E-6
0.4732	0.0039	22000	5000	7.84 E-7
0.4777	0.0045	27000	5000	8.96 E-7
0.4794	0.0017	29000	2000	8.40 E-7
0.4833	0.0039	31000	2000	1.96 E-6
0.4878	0.0045	33000	2000	2.24 E-6
0.4956	0.0078	35000	2000	3.92 E-6
0.5023	0.0067	37000	2000	3.36 E-6
0.5096	0.0073	39000	2000	3.64 E-6
0.5158	0.0062	41000	2000	3.08 E-6
0.5236	0.0078	43000	2000	3.92 E-6
RUN NO. 2				
0.5258	0.0022	44000	1000	2.24 E-6
0.5286	0.0028	49000	5000	5.60 E-7
0.5320	0.0034	54000	5000	6.72 E-7
0.5359	0.0039	56000	2000	1.96 E-6
0.5393	0.0034	58000	2000	1.68 E-6
0.5449	0.0056	60000	2000	2.80 E-6
0.5505	0.0056	62000	2000	2.80 E-6
0.5572	0.0067	64000	2000	3.36 E-6
0.5639	0.0067	66000	2000	3.36 E-6
0.5712	0.0073	68000	2000	3.64 E-6
0.5785	0.0073	70000	2000	3.64 E-6
RUN NO. 3				
0.5824	0.0039	71000	1000	3.92 E-6
0.5852	0.0028	76000	5000	5.60 E-7
0.5880	0.0028	81000	5000	5.60 E-7
0.5908	0.0028	83000	2000	1.40 E-6
0.5936	0.0028	85000	2000	1.40 E-6
0.5992	0.0056	87000	2000	2.80 E-6
0.6048	0.0056	89000	2000	2.80 E-6
0.6121	0.0073	91000	2000	3.64 E-6
0.6199	0.0078	93000	2000	3.92 E-6
0.6278	0.0078	95000	2000	3.92 E-6
0.6356	0.0078	97000	2000	3.92 E-6

TABLE 48 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	2.80 E-6	0.0014	500
2	6.35 E-7	0.0044	3500
3	7.09 E-7	0.0077	8500
4	1.40 E-6	0.0109	12000
5	1.68 E-6	0.0140	14000
6	2.61 E-6	0.0183	16000
7	3.17 E-6	0.0241	18000
8	3.45 E-6	0.0307	20000
9	3.64 E-6	0.0378	22000
10	3.55 E-6	0.0450	24000
11	3.83 E-6	0.0524	26000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0028	1000
2	0.0060	6000
3	0.0095	11000
4	0.0123	13000
5	0.0157	15000
6	0.0209	17000
7	0.0273	19000
8	0.0342	21000
9	0.0414	23000
10	0.0485	25000
11	0.0562	27000

TABLE 49

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 6-L-7, TENSION-ZERO  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.5$ ,  $1/u=0$ ,  $S=2$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.0937	0.0006	55000	1000	5.60 E-7
1.0942	0.0006	59000	4000	1.40 E-7
1.0942	0.0000	63000	4000	0.00 E+0
1.0965	0.0022	67000	4000	5.60 E-7
1.0982	0.0017	71000	4000	4.20 E-7
1.0998	0.0017	75000	4000	4.20 E-7
1.1026	0.0028	79000	4000	7.00 E-7
1.1049	0.0022	81000	2000	1.12 E-6
1.1071	0.0022	83000	2000	1.12 E-6
1.1094	0.0022	85000	2000	1.12 E-6
1.1116	0.0022	87000	2000	1.12 E-6
1.1133	0.0017	89000	2000	8.40 E-7
1.1161	0.0028	91000	2000	1.40 E-6
1.1183	0.0022	93000	2000	1.12 E-6
1.1217	0.0034	95000	2000	1.68 E-6
1.1239	0.0022	97000	2000	1.12 E-6
1.1267	0.0028	99000	2000	1.40 E-6
1.1295	0.0028	101000	2000	1.40 E-6
1.1318	0.0022	103000	2000	1.12 E-6
RUN NO. 2				
1.1334	0.0017	104000	1000	1.68 E-6
1.1334	0.0000	108000	4000	0.00 E+0
1.1340	0.0026	112000	4000	1.40 E-7
1.1346	0.0006	116000	4000	1.40 E-7
1.1362	0.0017	120000	4000	4.20 E-7
1.1368	0.0006	124000	4000	1.40 E-7
1.1390	0.0022	128000	4000	5.60 E-7
1.1407	0.0017	130000	2000	8.40 E-7
1.1430	0.0022	132000	2000	1.12 E-6
1.1452	0.0022	134000	2000	1.12 E-6
1.1474	0.0022	136000	2000	1.12 E-6
1.1491	0.0017	138000	2000	8.40 E-7
1.1508	0.0017	140000	2000	8.40 E-7
1.1547	0.0039	142000	2000	1.96 E-6
1.1570	0.0022	144000	2000	1.12 E-6
1.1598	0.0028	146000	2000	1.40 E-6
1.1626	0.0028	148000	2000	1.40 E-6
1.1665	0.0039	150000	2000	1.96 E-6
1.1687	0.0022	152000	2000	1.12 E-6

TABLE 49 (continued)

RUN NO. 3

1.1698	0.0011	153000	1000	1.12 E-6
1.1710	0.0011	157000	4000	2.80 E-7
1.1715	0.0006	161000	4000	1.40 E-7
1.1726	0.0011	165000	4000	2.80 E-7
1.1732	0.0006	169000	4000	1.40 E-7
1.1749	0.0017	173000	4000	4.20 E-7
1.1771	0.0022	177000	4000	5.60 E-7
1.1782	0.0011	179000	2000	5.60 E-7
1.1799	0.0017	181000	2000	8.40 E-7
1.1816	0.0017	183000	2000	8.40 E-7
1.1838	0.0022	185000	2000	1.12 E-6
1.1861	0.0022	187000	2000	1.12 E-6
1.1889	0.0028	189000	2000	1.40 E-6
1.1911	0.0022	191000	2000	1.12 E-6
1.1950	0.0039	193000	2000	1.96 E-6
1.1973	0.0022	195000	2000	1.12 E-6
1.1995	0.0022	197000	2000	1.12 E-6
1.2034	0.0039	199000	2000	1.96 E-6
1.2057	0.0022	201000	2000	1.12 E-6

TABLE 49 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	1.12 E-6	0.0006	500
2	1.40 E-7	0.0014	3000
3	9.33 E-8	0.0019	7000
4	3.27 E-7	0.0027	11000
5	3.27 E-7	0.0040	15000
6	3.27 E-7	0.0053	19000
7	6.07 E-7	0.0072	23000
8	8.40 E-7	0.0092	26000
9	1.03 E-6	0.0111	28000
10	1.03 E-6	0.0132	30000
11	1.12 E-6	0.0153	32000
12	9.33 E-7	0.0174	34000
13	1.21 E-6	0.0195	36000
14	1.40 E-6	0.0221	38000
15	1.59 E-6	0.0251	40000
16	1.21 E-6	0.0279	42000
17	1.31 E-6	0.0304	44000
18	1.77 E-6	0.0335	46000
19	1.12 E-6	0.0364	48000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0011	1000
2	0.0017	5000
3	0.0021	9000
4	0.0034	13000
5	0.0047	17000
6	0.0060	21000
7	0.0084	25000
8	0.0101	27000
9	0.0121	29000
10	0.0142	31000
11	0.0164	33000
12	0.0183	35000
13	0.0207	37000
14	0.0235	39000
15	0.0267	41000
16	0.0291	43000
17	0.0317	45000
18	0.0353	47000
19	0.0375	49000

TABLE 50

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 2-L-14, TENSION-ZERO  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.1$ ,  $1/U=0$ ,  $S=2.5$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.5096	0.0050	3000	1000	5.04 E-6
0.5141	0.0045	11000	8000	5.60 E-7
0.5163	0.0022	19000	3000	2.80 E-7
0.5197	0.0034	27000	8000	4.20 E-7
0.5253	0.0062	35000	8000	7.70 E-7
0.5320	0.0061	39000	4000	1.60 E-6
0.5370	0.0050	41000	2000	2.52 E-6
0.5429	0.0059	43000	2000	2.94 E-6
0.5483	0.0059	45000	2000	2.94 E-6
0.5555	0.0067	47000	2000	3.36 E-6
0.5600	0.0045	48000	1000	4.48 E-6
0.5645	0.0045	49000	1000	4.48 E-6
0.5690	0.0045	50000	1000	4.48 E-6
0.5734	0.0045	51000	1000	4.48 E-6
0.5774	0.0039	52000	1000	3.92 E-6
0.5813	0.0045	53000	1000	4.48 E-6
0.5872	0.0053	54000	1000	5.32 E-6
0.5908	0.0036	55000	1000	3.64 E-6
0.5950	0.0042	56000	1000	4.20 E-6
0.5992	0.0042	57000	1000	4.20 E-6
0.6040	0.0048	58000	1000	4.76 E-6
0.6084	0.0045	59000	1000	4.48 E-6
0.6126	0.0042	60000	1000	4.20 E-6
0.6177	0.0050	61000	1000	5.04 E-6
0.6227	0.0050	62000	1000	5.04 E-6
0.6272	0.0045	63000	1000	4.48 E-6

TABLE 50 (continued)

RUN NO. 2

0.8212	0.0042	153000	1000	4.20 E-6
0.8252	0.0039	161000	8000	4.90 E-7
0.8277	0.0025	169000	8000	3.15 E-7
0.8288	0.0011	177000	8000	1.40 E-7
0.8322	0.0034	185000	8000	4.20 E-7
0.8366	0.0045	189000	4000	1.12 E-6
0.8389	0.0022	191000	2000	1.12 E-6
0.8448	0.0059	193000	2000	2.94 E-6
0.8495	0.0048	195000	2000	2.38 E-6
0.8576	0.0061	197000	2000	4.06 E-6
0.8616	0.0039	198000	1000	3.92 E-6
0.8658	0.0042	199000	1000	4.20 E-6
0.8700	0.0042	200000	1000	4.20 E-6
0.8742	0.0042	201000	1000	4.20 E-6
0.8786	0.0045	202000	1000	4.48 E-6
0.8828	0.0042	203000	1000	4.20 E-6
0.8870	0.0042	204000	1000	4.20 E-6
0.8915	0.0045	205000	1000	4.48 E-6
0.8957	0.0042	206000	1000	4.20 E-6
0.8999	0.0042	207000	1000	4.20 E-6
0.9050	0.0050	208000	1000	5.04 E-6
0.9097	0.0048	209000	1000	4.76 E-6
0.9142	0.0045	210000	1000	4.48 E-6
0.9190	0.0048	211000	1000	4.76 E-6
0.9234	0.0045	212000	1000	4.48 E-6
0.9282	0.0048	213000	1000	4.76 E-6

RUN NO. 3

0.9428	0.0036	217000	1000	3.64 E-6
0.9481	0.0053	225000	8000	6.65 E-7
0.9500	0.0020	233000	8000	2.45 E-7
0.9514	0.0014	241000	8000	1.75 E-7
0.9531	0.0017	249000	8000	2.10 E-7
0.9556	0.0025	253000	4000	6.30 E-7
0.9576	0.0020	255000	2000	9.80 E-7
0.9607	0.0031	257000	2000	1.54 E-6
0.9632	0.0025	259000	2000	1.26 E-6
0.9680	0.0048	261000	2000	2.38 E-6
0.9708	0.0028	262000	1000	2.80 E-6
0.9744	0.0036	263000	1000	3.64 E-6
0.9783	0.0039	264000	1000	3.92 E-6
0.9823	0.0045	265000	1000	4.48 E-6
0.9870	0.0042	266000	1000	4.20 E-6
0.9915	0.0045	267000	1000	4.48 E-6
0.9957	0.0042	268000	1000	4.20 E-6
0.9999	0.0042	269000	1000	4.20 E-6
1.0038	0.0039	270000	1000	3.92 E-6
1.0080	0.0042	271000	1000	4.20 E-6
1.0123	0.0048	272000	1000	4.76 E-6
1.0167	0.0039	273000	1000	3.92 E-6
1.0214	0.0048	274000	1000	4.76 E-6
1.0254	0.0039	275000	1000	3.92 E-6
1.0331	0.0048	276000	1000	4.76 E-6
1.0343	0.0042	277000	1000	4.20 E-6



TABLE 50 (continued)  
AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	4.29 E-6	0.0021	500
2	5.72 E-7	0.0066	5000
3	2.30 E-7	0.0100	13000
4	2.45 E-7	0.0121	21000
5	4.67 E-7	0.0149	29000
6	1.14 E-6	0.0190	35000
7	1.54 E-6	0.0227	38000
8	2.47 E-6	0.0267	40000
9	2.19 E-6	0.0314	42000
10	3.27 E-6	0.0369	44000
11	3.73 E-6	0.0420	45500
12	4.11 E-6	0.0459	46500
13	4.20 E-6	0.0500	47500
14	4.39 E-6	0.0543	48500
15	4.20 E-6	0.0586	49500
16	4.39 E-6	0.0629	50500
17	4.57 E-6	0.0674	51500
18	4.11 E-6	0.0718	52500
19	4.11 E-6	0.0759	53500
20	4.20 E-6	0.0800	54500
21	4.85 E-6	0.0845	55500
22	4.39 E-6	0.0892	56500
23	4.48 E-6	0.0936	57500
24	4.57 E-6	0.0981	58500
25	4.76 E-6	0.1028	59500
26	4.48 E-6	0.1074	60500

AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0043	1000
2	0.0389	9000
3	0.0111	17000
4	0.0130	25000
5	0.0168	33000
6	0.0212	37000
7	0.0242	39000
8	0.0292	41000
9	0.0336	43000
10	0.0401	45000
11	0.0433	46000
12	0.0479	47000
13	0.0521	48000
14	0.0565	49000
15	0.0607	50000
16	0.0651	51000
17	0.0697	52000
18	0.0738	53000
19	0.0779	54000
20	0.0821	55000
21	0.0870	56000
22	0.0914	57000
23	0.0958	58000
24	0.1004	59000
25	0.1052	60000
26	0.1097	61000

TABLE 51

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 3-L-19, TENSION-ZERO  
 F=12Hz, K2=10, R=0.3, 1/U=0, S=2.5

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.5555	0.0056	131000	2000	2.80 E-6
0.5600	0.0045	171000	40000	1.12 E-7
0.5662	0.0062	191000	20000	3.08 E-7
0.5751	0.0089	201000	10000	9.56 E-7
0.5863	0.0112	209000	8000	1.40 E-6
0.5902	0.0039	211000	2000	1.96 E-6
0.5964	0.0062	213000	2000	3.08 E-6
0.6003	0.0039	215000	2000	1.96 E-6
0.6054	0.0050	217000	2000	2.52 E-6
0.6098	0.0045	219000	2000	2.24 E-6
0.6149	0.0050	221000	2000	2.52 E-6
0.6205	0.0056	223000	2000	2.80 E-6
0.6261	0.0056	225000	2000	2.80 E-6
0.6322	0.0062	227000	2000	3.08 E-6
0.6373	0.0050	229000	2000	2.52 E-6
0.6429	0.0056	231000	2000	2.80 E-6
0.6479	0.0050	233000	2000	2.52 E-6
0.6530	0.0050	235000	2000	2.52 E-6
0.6569	0.0039	237000	2000	1.96 E-6
0.6614	0.0045	239000	2000	2.24 E-6

TABLE 51 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	2.80 E-6	0.0028	1000
2	1.12 E-7	0.0078	22000
3	3.08 E-7	0.0132	52000
4	9.56 E-7	0.0208	67000
5	1.40 E-6	0.0308	76000
6	1.96 E-6	0.0384	81000
7	3.08 E-6	0.0434	83000
8	1.96 E-6	0.0485	85000
9	2.52 E-6	0.0529	87000
10	2.24 E-6	0.0577	89000
11	2.52 E-6	0.0624	91000
12	2.80 E-6	0.0677	93000
13	2.80 E-6	0.0733	95000
14	3.08 E-6	0.0792	97000
15	2.52 E-6	0.0848	99000
16	2.80 E-6	0.0901	101000
17	2.52 E-6	0.0954	103000
18	2.52 E-6	0.1005	105000
19	1.96 E-6	0.1049	107000
20	2.24 E-6	0.1091	109000

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0056	2000
2	0.0101	42000
3	0.0163	62000
4	0.0252	72000
5	0.0364	80000
6	0.0403	82000
7	0.0465	84000
8	0.0504	86000
9	0.0554	88000
10	0.0599	90000
11	0.0649	92000
12	0.0705	94000
13	0.0761	96000
14	0.0823	98000
15	0.0873	100000
16	0.0929	102000
17	0.0979	104000
18	0.1030	106000
19	0.1069	108000
20	0.1114	110000

TABLE 52

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 4-L-18, TENSION-ZERO  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.5$ ,  $1/U=0$ ,  $S=2.5$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.8487	0.0011	137000	1000	1.12 E-6
0.8506	0.0020	157000	20000	9.80 E-8
0.8515	0.0009	177000	20000	4.20 E-8
0.8526	0.0012	197000	20000	5.60 E-8
0.8543	0.0017	209000	12000	1.40 E-7
0.8548	0.0006	213000	4000	1.40 E-7
0.8548	0.0000	217000	4000	0.00 E+0
0.8548	0.0000	221000	4000	0.00 E+0
0.8548	0.0000	225000	4000	0.00 E+0
0.8554	0.0006	229000	4000	1.40 E-7
0.8557	0.0003	233000	4000	7.00 E-8
0.8562	0.0006	237000	4000	1.40 E-7
0.8568	0.0006	241000	4000	1.40 E-7
0.8579	0.0011	245000	4000	2.80 E-7
0.8590	0.0012	249000	4000	2.80 E-7
0.8610	0.0019	253000	4000	4.90 E-7
0.8624	0.0014	255000	2000	7.00 E-7
0.8641	0.0017	257000	2000	8.40 E-7
0.8666	0.0025	259000	2000	1.26 E-6
0.8677	0.0011	261000	2000	5.60 E-7
0.8697	0.0020	263000	2000	9.80 E-7
0.8711	0.0014	265000	2000	7.00 E-7
0.8725	0.0014	267000	2000	7.00 E-7
0.8756	0.0031	269000	2000	1.54 E-6
0.8778	0.0022	271000	2000	1.12 E-6
0.8812	0.0034	273000	2000	1.70 E-6

TABLE 52 (continued)

RUN NO. 2

0.9677	0.0008	338000	1000	8.40 E-7
0.9688	0.0011	358000	20000	5.60 E-8
0.9710	0.0022	378000	20000	1.12 E-7
0.9719	0.0008	398000	20000	4.20 E-8
0.9727	0.0009	410000	12000	7.00 E-8
0.9733	0.0006	414000	4000	1.40 E-7
0.9733	0.0000	418000	4000	0.00 E+0
0.9736	0.0003	422000	4000	7.00 E-8
0.9747	0.0012	426000	4000	2.80 E-7
0.9752	0.0006	430000	4000	1.40 E-7
0.9766	0.0014	434000	4000	3.50 E-7
0.9792	0.0025	438000	4000	6.30 E-7
0.9811	0.0019	442000	4000	4.90 E-7
0.9850	0.0040	446000	4000	9.80 E-7
0.9892	0.0042	450000	4000	1.05 E-6
0.9929	0.0036	454000	4000	9.10 E-7
0.9948	0.0020	456000	2000	9.80 E-7
0.9974	0.0025	458000	2000	1.26 E-6
0.9988	0.0014	460000	2000	7.00 E-7
1.0002	0.0014	462000	2000	7.00 E-7
1.0030	0.0028	464000	2000	1.40 E-6
1.0046	0.0017	466000	2000	8.40 E-7
1.0069	0.0022	468000	2000	1.12 E-6
1.0100	0.0031	470000	2000	1.54 E-6
1.0119	0.0020	472000	2000	9.80 E-7
1.0144	0.0025	474000	2000	1.26 E-6

TABLE 52 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	9.80 E-7	0.0005	500
2	7.70 E-8	0.0018	11000
3	7.70 E-8	0.0033	31000
4	4.90 E-8	0.0046	51000
5	1.05 E-7	0.0057	67000
6	1.40 E-7	0.0067	75000
7	0.00 E+0	0.0070	79000
8	3.50 E-8	0.0071	83000
9	1.40 E-7	0.0074	87000
10	1.40 E-7	0.0080	91000
11	2.10 E-7	0.0088	95000
12	3.85 E-7	0.0100	99000
13	3.15 E-7	0.0114	103000
14	6.30 E-7	0.0133	107000
15	6.65 E-7	0.0159	111000
16	7.00 E-7	0.0186	115000
17	8.40 E-7	0.0208	118000
18	1.05 E-6	0.0227	120000
19	9.80 E-7	0.0248	122000
20	6.30 E-7	0.0264	124000
21	1.19 E-6	0.0282	126000
22	7.70 E-7	0.0302	128000
23	9.10 E-7	0.0318	130000
24	1.54 E-6	0.0343	132000
25	1.05 E-6	0.0369	134000
26	1.48 E-6	0.0394	136000

TABLE 52 (continued)

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0010	1000
2	0.0025	21000
3	0.0041	41000
4	0.0051	61000
5	0.0064	73000
6	0.0070	77000
7	0.0070	81000
8	0.0071	85000
9	0.0077	89000
10	0.0083	93000
11	0.0092	97000
12	0.0107	101000
13	0.0120	105000
14	0.0145	109000
15	0.0172	113000
16	0.0200	117000
17	0.0217	119000
18	0.0238	121000
19	0.0257	123000
20	0.0270	125000
21	0.0294	127000
22	0.0309	129000
23	0.0327	131000
24	0.0358	133000
25	0.0379	135000
26	0.0409	137000

TABLE 53  
EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
TEMPERATURE DESICCATED AIR  
SPECIMEN NO. 3-L-4, TENSION-ZERO  
 $K_2=10$ ,  $R=0.5$ ,  $1/U=0$ ,  $S=2.6$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.3759	0.0028	77500	1000	2.80 E-6
1.3759	0.0000	97500	20000	0.00 E+0
1.3765	0.0006	117500	20000	2.80 E-8
1.3765	0.0000	137500	20000	0.00 E+0
1.3770	0.0006	157500	20000	2.80 E-8
1.3770	0.0000	177500	20000	0.00 E+0
1.3773	0.0003	197500	20000	1.40 E-8
1.3779	0.0006	217500	20000	2.80 E-8
1.3801	0.0022	237500	20000	1.12 E-7
1.3810	0.0008	242500	5000	1.68 E-7
1.3818	0.0008	247500	5000	1.68 E-7
1.3849	0.0031	252500	5000	6.16 E-7
1.3882	0.0034	257500	5000	6.72 E-7
1.3905	0.0022	259500	2000	1.12 E-6
1.3919	0.0014	261500	2000	7.00 E-7
1.3930	0.0011	263500	2000	5.60 E-7
1.3950	0.0020	265500	2000	9.80 E-7

Test performed to zero-in on overload shut-off ratio. Test terminated prior to reaching  $(da/dN)_c$ .



TABLE 54

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 3-L-4, TENSION-ZERO  
 $K_2 = 10$ ,  $R = 0.5$ ,  $1/U = 0$ ,  $S = 2.7$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.5002	0.0014	52000	1000	1.40 E-6
1.5019	0.0017	92000	40000	4.20 E-8
1.5022	0.0003	132000	40000	7.00 E-9
1.5022	0.0000	172000	40000	0.00 E+0
1.5022	0.0000	212000	40000	0.00 E+0
1.5025	0.0003	252000	40000	7.00 E-9
1.5025	0.0000	292000	40000	0.00 E+0
1.5025	0.0000	312000	20000	0.00 E+0
1.5025	0.0000	332000	20000	0.00 E+0
1.5025	0.0000	352000	20000	0.00 E+0
1.5025	0.0000	372000	20000	0.00 E+0
1.5025	0.0000	392000	20000	0.00 E+0
1.5025	0.0000	412000	20000	0.00 E+0
1.5028	0.0003	432000	20000	1.40 E-8
1.5028	0.0000	452000	20000	0.00 E+0
1.5028	0.0000	472000	20000	0.00 E+0
1.5039	0.0011	492000	20000	5.60 E-8
1.5039	0.0000	512000	20000	0.00 E+0
1.5070	0.0031	532000	20000	1.54 E-7
1.5114	0.0045	542000	10000	4.48 E-7

Test performed to zero-in on overload shut-off ratio. Test terminated prior to reaching (da/dN) .

c

TABLE 55  
EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
TEMPERATURE DESICCATED AIR  
SPECIMEN NO. 1-L-1, TENSION-ZERO  
F=12Hz,  $K_2=10$ , R=0.5, 1/U=0, S=2.8

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.1250	0.00008	1000	1000	8.40 E-7
1.1264	0.00014	26000	25000	5.60 E-8
1.1267	0.00003	51000	25000	1.12 E-8
1.1267	0.00000	76000	25000	0.00 E+0
1.1267	0.00000	101000	25000	0.00 E+0
1.1270	0.00003	126000	25000	1.12 E-8
1.1270	0.00000	151000	25000	0.00 E+0
1.1270	0.00000	176000	25000	0.00 E+0
1.1270	0.00000	201000	25000	0.00 E+0
1.1273	0.00003	226000	25000	1.12 E-8
1.1273	0.00000	251000	25000	0.00 E+0
1.1273	0.00000	276000	25000	0.00 E+0
1.1273	0.00000	301000	25000	0.00 E+0
1.1278	0.00006	326000	25000	2.24 E-8
1.1295	0.00017	351000	25000	6.72 E-8
1.1491	0.00196	376000	25000	7.84 E-7
1.1614	0.00123	386000	10000	1.23 E-6

Test performed to zero-in on overload shut-off ratio. Test terminated prior to reaching  $(da/dN)_c$ .

TABLE 56  
EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
TEMPERATURE DESICCATED AIR  
SPECIMEN NO. 1-L-1, TENSION-ZERO  
F=12Hz,  $K_2=10$ , R=0.5, 1/U=0, S=2.9

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.3650	0.0011	25000	1000	1.12 E-6
1.3656	0.0006	50000	25000	2.24 E-8
1.3661	0.0006	75000	25000	2.24 E-8
1.3661	0.0000	100000	25000	0.00 E+0
1.3661	0.0000	125000	25000	0.00 E+0
1.3661	0.0000	150000	25000	0.00 E+0
1.3661	0.0000	175000	25000	0.00 E+0
1.3661	0.0000	200000	25000	0.00 E+0
1.3661	0.0000	225000	25000	0.00 E+0
1.3675	0.0014	250000	25000	5.60 E-8
1.3675	0.0000	275000	25000	0.00 E+0
1.3675	0.0000	300000	25000	0.00 E+0
1.3675	0.0000	325000	25000	0.00 E+0
1.3678	0.0003	350000	25000	1.12 E-8
1.3678	0.0000	375000	25000	0.00 E+0
1.3678	0.0000	400000	25000	0.00 E+0
1.3678	0.0000	425000	25000	0.00 E+0
1.3678	0.0000	450000	25000	0.00 E+0
1.3678	0.0000	475000	25000	0.00 E+0
1.3678	0.0000	500000	25000	0.00 E+0
1.3678	0.0000	525000	25000	0.00 E+0
1.3678	0.0000	550000	25000	0.00 E+0
1.3678	0.0000	575000	25000	0.00 E+0
1.3678	0.0000	600000	25000	0.00 E+0
1.3678	0.0000	625000	25000	0.00 E+0
1.3678	0.0000	650000	25000	0.00 E+0

S=2.9 considered to be overload shut-off ratio for this case.

TABLE 57

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 2-L-16, TENSION-ZERO  
 F=12Hz,  $K_2=10$ , R=0.1, 1/U=0, S=3.0

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.5130	0.0045	7000	1000	4.48 E-6
0.5208	0.0078	47000	40000	1.96 E-7
0.5242	0.0034	87000	40000	8.40 E-8
0.5264	0.0022	127000	40000	5.60 E-8
0.5410	0.0146	167000	40000	3.64 E-7
0.5734	0.0325	177000	10000	3.25 E-6
0.5813	0.0078	179000	2000	3.92 E-6
0.5902	0.0090	181000	2000	4.48 E-6
0.6003	0.0101	183000	2000	5.04 E-6
0.6082	0.0078	185000	2000	3.92 E-6
0.6160	0.0078	187000	2000	3.92 E-6
0.6238	0.0078	189000	2000	3.92 E-6
0.6306	0.0067	191000	2000	3.36 E-6
0.6384	0.0078	193000	2000	3.92 E-6
0.6474	0.0090	195000	2000	4.48 E-6
0.6563	0.0090	197000	2000	4.48 E-6
0.6653	0.0090	199000	2000	4.48 E-6
0.6754	0.0101	201000	2000	5.04 E-6
0.6832	0.0078	203000	2000	3.92 E-6
0.6910	0.0078	205000	2000	3.92 E-6
0.7011	0.0101	207000	2000	5.04 E-6
0.7112	0.0101	209000	2000	5.04 E-6
0.7213	0.0101	211000	2000	5.04 E-6
0.7302	0.0090	213000	2000	4.48 E-6
0.7403	0.0101	215000	2000	5.04 E-6
0.7504	0.0101	217000	2000	5.04 E-6
0.7605	0.0101	219000	2000	5.04 E-6

TABLE 57 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	4.48 E-6	0.0022	500
2	1.96 E-7	0.0084	21000
3	8.40 E-8	0.0140	61000
4	5.60 E-8	0.0168	101000
5	3.64 E-7	0.0252	141000
6	3.25 E-6	0.0487	166000
7	3.92 E-6	0.0689	172000
8	4.48 E-6	0.0773	174000
9	5.04 E-6	0.0868	176000
10	3.92 E-6	0.0958	178000
11	3.92 E-6	0.1036	180000
12	3.92 E-6	0.1114	182000
13	3.36 E-6	0.1187	184000
14	3.92 E-6	0.1260	186000
15	4.48 E-6	0.1344	188000
16	4.48 E-6	0.1434	190000
17	4.48 E-6	0.1523	192000
18	5.04 E-6	0.1618	194000
19	3.92 E-6	0.1708	196000
20	3.92 E-6	0.1786	198000
21	5.04 E-6	0.1876	200000
22	5.04 E-6	0.1977	202000
23	5.04 E-6	0.2078	204000
24	4.48 E-6	0.2173	206000
25	5.04 E-6	0.2268	208000
26	5.04 E-6	0.2369	210000
27	5.04 E-6	0.2470	212000

TABLE 57 (continued)

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0045	1000
2	0.0123	41000
3	0.0157	81000
4	0.0179	121000
5	0.0325	161000
6	0.0650	171000
7	0.0728	173000
8	0.0818	175000
9	0.0918	177000
10	0.0997	179000
11	0.1075	181000
12	0.1154	183000
13	0.1221	185000
14	0.1299	187000
15	0.1389	189000
16	0.1478	191000
17	0.1568	193000
18	0.1669	195000
19	0.1747	197000
20	0.1826	199000
21	0.1926	201000
22	0.2027	203000
23	0.2128	205000
24	0.2218	207000
25	0.2318	209000
26	0.2419	211000
27	0.2520	213000

Data for one crack tip.

TABLE 58

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 3-L-4, TENSION-ZERO  
 $K_t=10$ ,  $R=0.1$ ,  $1/u=0$ ,  $S=3.1$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.7028	0.0039	58750	1000	3.93 E-6
0.7050	0.0022	83750	25000	8.96 E-8
0.7062	0.0011	108750	25000	4.48 E-8
0.7070	0.0008	133750	25000	3.36 E-8
0.7073	0.0003	158750	25000	1.12 E-8
0.7076	0.0003	183750	25000	1.12 E-8
0.7076	0.0000	208750	25000	0.00 E+0
0.7078	0.0003	233750	25000	1.12 E-8
0.7078	0.0000	258750	25000	0.00 E+0
0.7078	0.0000	283750	25000	0.00 E+0
0.7078	0.0000	308750	25000	0.00 E+0
0.7078	0.0000	333750	25000	0.00 E+0
0.7078	0.0000	358750	25000	0.00 E+0
0.7078	0.0000	383750	25000	0.00 E+0
0.7078	0.0000	408750	25000	0.00 E+0
0.7078	0.0000	433750	25000	0.00 E+0
0.7078	0.0000	458750	25000	0.00 E+0
0.7078	0.0000	483750	25000	0.00 E+0
0.7078	0.0000	508750	25000	0.00 E+0
0.7081	0.0003	533750	25000	1.12 E-8
0.7081	0.0000	558750	25000	0.00 E+0
0.7095	0.0014	583750	25000	5.60 E-8
0.7112	0.0017	593750	10000	1.68 E-7
0.7238	0.0126	603750	10000	1.26 E-6

Test performed to zero-in on overload shut-off ratio. Test terminated prior to reaching  $(da/dN)_c$ .

TABLE 59

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 1-L-1, TENSION-ZERO  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.1$ ,  $1/U=0$ ,  $S=3.2$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.8053	0.0045	9000	1000	4.48 E-6
0.8058	0.0006	34000	25000	2.24 E-8
0.8058	0.0000	59000	25000	0.00 E+0
0.8058	0.0000	84000	25000	0.00 E+0
0.8058	0.0000	109000	25000	0.00 E+0
0.8058	0.0000	134000	25000	0.00 E+0
0.8058	0.0000	159000	25000	0.00 E+0
0.8058	0.0000	184000	25000	0.00 E+0
0.8058	0.0000	209000	25000	0.00 E+0
0.8058	0.0000	234000	25000	0.00 E+0
0.8058	0.0000	259000	25000	0.00 E+0
0.8058	0.0000	284000	25000	0.00 E+0
0.8058	0.0000	309000	25000	0.00 E+0
0.8058	0.0000	334000	25000	0.00 E+0
0.8058	0.0000	359000	25000	0.00 E+0
0.8058	0.0000	384000	25000	0.00 E+0
0.8058	0.0000	409000	25000	0.00 E+0
0.8058	0.0000	434000	25000	0.00 E+0
0.8058	0.0000	459000	25000	0.00 E+0
0.8058	0.0000	484000	25000	0.00 E+0
0.8058	0.0000	509000	25000	0.00 E+0
0.8058	0.0000	534000	25000	0.00 E+0
0.8058	0.0000	559000	25000	0.00 E+0
0.8058	0.0000	584000	25000	0.00 E+0
0.8058	0.0000	609000	25000	0.00 E+0
0.8058	0.0000	634000	25000	0.00 E+0
0.8058	0.0000	659000	25000	0.00 E+0
0.8058	0.0000	684000	25000	0.00 E+0
0.8058	0.0000	709000	25000	0.00 E+0

$S=3.2$  considered to be overload shut-off ratio for this case.



TABLE 60

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 3-L-7, TENSION-ZERO  
 $K_2 = 10$ ,  $R = 0.3$ ,  $1/U = 0$ ,  $S = 2.7$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.5230	0.0045	7000	1000	4.48 E-6
0.5261	0.0031	27000	20000	1.54 E-7
0.5272	0.0011	47000	20000	5.60 E-8
0.5289	0.0017	67000	20000	8.40 E-8
0.5289	0.0000	87000	20000	0.00 E+0
0.5314	0.0025	107000	20000	1.26 E-7
0.5393	0.0078	127000	20000	3.92 E-7
0.5482	0.0090	147000	20000	4.48 E-7
0.6101	0.0619	167000	20000	3.09 E-6

Test performed to zero-in on overload shut-off ratio. Test  
 terminated prior to reaching (da/dN) .

c

TABLE 61

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 3-L-7, TENSION-ZERO  
 $K_2 = 10$ ,  $R = 0.3$ ,  $1/U = 0$ ,  $S = 2.8$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.6331	0.0034	7000	1000	3.36 E-6
0.6370	0.0039	27000	20000	1.96 E-7
0.6378	0.0008	47000	20000	4.20 E-8
0.6387	0.0008	67000	20000	4.20 E-8
0.6404	0.0017	87000	20000	8.40 E-8
0.6404	0.0000	107000	20000	0.00 E+0
0.6406	0.0003	127000	20000	1.40 E-8
0.6412	0.0006	147000	20000	2.80 E-8
0.6415	0.0003	167000	20000	1.40 E-8
0.6429	0.0014	187000	20000	7.00 E-8
0.6437	0.0008	197000	9750	8.62 E-8
0.6460	0.0022	207000	10000	2.24 E-7
0.6502	0.0042	212000	5000	8.40 E-7

Test performed to zero-in on overload shut-off ratio. Test  
 terminated prior to reaching (da/dN) .

c

TABLE 62

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
TEMPERATURE DESICCATED AIR

SPECIMEN NO. 3-L-7, TENSION-ZERO

$F = 12\text{Hz}$ ,  $K_2 = 10$ ,  $R = 0.3$ ,  $1/U = 0$ ,  $S = 2.9$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.7650	0.0036	15500	1000	3.64 E-6
0.7680	0.0031	40500	25000	1.23 E-7
0.7683	0.0003	65500	25000	1.12 E-8
0.7689	0.0006	90500	25000	2.24 E-8
0.7700	0.0011	115500	25000	4.48 E-8
0.7708	0.0008	140500	25000	3.36 E-8
0.7711	0.0003	165500	25000	1.12 E-8
0.7711	0.0000	190500	25000	0.00 E+0
0.7717	0.0006	215500	25000	2.24 E-8
0.7717	0.0000	240500	25000	0.00 E+0
0.7717	0.0000	265500	25000	0.00 E+0
0.7722	0.0006	290500	25000	2.24 E-8
0.7722	0.0000	315500	25000	0.00 E+0
0.7722	0.0000	340500	25000	0.00 E+0
0.7742	0.0020	365500	25000	7.84 E-8
0.7759	0.0017	390500	25000	6.72 E-8
0.8128	0.0370	415500	25000	1.48 E-6
0.8235	0.0106	420500	5000	2.13 E-6

Test performed to zero-in on overload shut-off ratio.  
Test terminated prior to reaching (da/dN) .

TABLE 63

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 3-L-4, TENSION-ZERO  
 $K_2=10$ ,  $R=0.3$ ,  $1/U=0$ ,  $S=3.0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.0114	0.0017	5000	1000	1.68 E-6
1.0144	0.0031	45000	40000	7.70 E-8
1.0144	0.0000	85000	40000	0.00 E+0
1.0147	0.0003	125000	40000	7.00 E-9
1.0147	0.0000	165000	40000	0.00 E+0
1.0153	0.0006	205000	40000	1.40 E-8
1.0153	0.0000	245000	40000	0.00 E+0
1.0153	0.0000	285000	40000	0.00 E+0
1.0153	0.0000	325000	40000	0.00 E+0
1.0153	0.0000	365000	40000	0.00 E+0
1.0153	0.0000	385000	20000	0.00 E+0
1.0153	0.0000	405000	20000	0.00 E+0
1.0153	0.0000	425000	20000	0.00 E+0
1.0153	0.0000	445000	20000	0.00 E+0
1.0153	0.0000	465000	20000	0.00 E+0
1.0153	0.0000	485000	20000	0.00 E+0
1.0153	0.0000	505000	20000	0.00 E+0
1.0153	0.0000	525000	20000	0.00 E+0
1.0153	0.0000	545000	20000	0.00 E+0
1.0153	0.0000	565000	20000	0.00 E+0
1.0153	0.0000	585000	20000	0.00 E+0
1.0153	0.0000	605000	20000	0.00 E+0
1.0153	0.0000	625000	20000	0.00 E+0
1.0153	0.0000	645000	20000	0.00 E+0
1.0153	0.0000	665000	20000	0.00 E+0
1.0153	0.0000	685000	20000	0.00 E+0
1.0153	0.0000	705000	20000	0.00 E+0
1.0153	0.0000	725000	20000	0.00 E+0

$S=3.0$  considered to be overload shut-off ratio for this case.

Data Tabulations for Tension-Zero Load Class,  
 $K_2=7.78$  and  $14 \text{ KSI } \sqrt{\text{In.}}$

TABLE 64  
EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
TEMPERATURE DESICCATED AIR  
SPECIMEN NO. 5-L-20, TENSION-ZERO  
F=12Hz, K2=7.78, R=0.1, 1/U=0, S=1.5

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.5060	0.0017	49000	1000	1.68 E-6
0.5079	0.0020	51000	2000	9.80 E-7
0.5121	0.0042	53000	2000	2.10 E-6
0.5144	0.0022	55000	2000	1.12 E-6
0.5194	0.0050	57000	2000	2.52 E-6
0.5219	0.0025	59000	2000	1.26 E-6
0.5258	0.0039	61000	2000	1.96 E-6
0.5300	0.0042	63000	2000	2.10 E-6
RUN NO. 2				
0.5306	0.0006	64000	1000	5.60 E-7
0.5331	0.0025	66000	2000	1.26 E-6
0.5356	0.0025	68000	2000	1.26 E-6
0.5401	0.0045	70000	2000	2.24 E-6
0.5438	0.0036	72000	2000	1.82 E-6
0.5474	0.0036	74000	2000	1.82 E-6
0.5524	0.0050	76000	2000	2.52 E-6
0.5566	0.0042	78000	2000	2.10 E-6
RUN NO. 3				
0.5583	0.0017	79000	1000	1.68 E-6
0.5606	0.0022	81000	2000	1.12 E-6
0.5645	0.0039	83000	2000	1.96 E-6
0.5676	0.0031	85000	2000	1.54 E-6
0.5712	0.0036	87000	2000	1.82 E-6
0.5754	0.0042	89000	2000	2.10 E-6
0.5802	0.0048	91000	2000	2.38 E-6
0.5846	0.0045	93000	2000	2.24 E-6

TABLE 64 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	1.31 E-6	0.0007	500
2	1.12 E-6	0.0024	2000
3	1.77 E-6	0.0053	4000
4	1.63 E-6	0.0087	6000
5	2.05 E-6	0.0124	8000
6	1.73 E-6	0.0162	10000
7	2.29 E-6	0.0202	12000
8	2.15 E-6	0.0246	14000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0013	1000
2	0.0035	3000
3	0.0071	5000
4	0.0104	7000
5	0.0145	9000
6	0.0179	11000
7	0.0225	13000
8	0.0268	15000

TABLE 65  
EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
TEMPERATURE DESICCATED AIR  
SPECIMEN NO. 5-L-20, TENSION-ZERO  
F=12Hz,  $K_2=7.78$ , R=0.1, 1/U=0, S=2.0

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.6395	0.0017	12000	1000	1.68 E-6
0.6423	0.0028	16000	4000	7.00 E-7
0.6429	0.0006	20000	4000	1.40 E-7
0.6460	0.0031	24000	4000	7.70 E-7
0.6474	0.0014	26000	2000	7.00 E-7
0.6502	0.0028	28000	2000	1.40 E-6
0.6527	0.0025	30000	2000	1.26 E-6
0.6558	0.0031	32000	2000	1.54 E-6
0.6597	0.0039	34000	2000	1.96 E-6
0.6644	0.0048	36000	2000	2.38 E-6
0.6675	0.0031	38000	2000	1.54 E-6
0.6723	0.0048	40000	2000	2.38 E-6
0.6759	0.0036	42000	2000	1.82 E-6
0.6793	0.0039	44000	2000	1.96 E-6
0.6838	0.0039	46000	2000	1.96 E-6
RUN NO. 2				
0.6854	0.0017	47000	1000	1.68 E-6
0.6874	0.0020	51000	4000	4.90 E-7
0.6891	0.0017	55000	4000	4.20 E-7
0.6919	0.0028	59000	4000	7.00 E-7
0.6947	0.0028	61000	2000	1.40 E-6
0.6980	0.0034	63000	2000	1.68 E-6
0.7011	0.0031	65000	2000	1.54 E-6
0.7045	0.0034	67000	2000	1.68 E-6
0.7081	0.0036	69000	2000	1.82 E-6
0.7132	0.0050	71000	2000	2.52 E-6
0.7165	0.0034	73000	2000	1.68 E-6
0.7207	0.0042	75000	2000	2.10 E-6
0.7249	0.0042	77000	2000	2.10 E-6
0.7302	0.0053	79000	2000	2.66 E-6
0.7339	0.0036	81000	2000	1.82 E-6



TABLE 65 (continued)

RUN NO. 3

0.7353	0.0014	82000	1000	1.40 E-6
0.7375	0.0022	86000	4000	5.60 E-7
0.7395	0.0020	90000	4000	4.90 E-7
0.7428	0.0034	94000	4000	8.40 E-7
0.7454	0.0025	96000	2000	1.26 E-6
0.7484	0.0031	98000	2000	1.54 E-6
0.7512	0.0028	100000	2000	1.40 E-6
0.7549	0.0036	102000	2000	1.82 E-6
0.7591	0.0042	104000	2000	2.10 E-6
0.7624	0.0034	106000	2000	1.68 E-6
0.7664	0.0039	108000	2000	1.96 E-6
0.7703	0.0039	110000	2000	1.96 E-6
0.7748	0.0045	112000	2000	2.24 E-6
0.7781	0.0034	114000	2000	1.68 E-6
0.7823	0.0042	116000	2000	2.10 E-6

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	1.59 E-6	0.0008	500
2	5.83 E-7	0.0028	3000
3	3.50 E-7	0.0046	7000
4	7.70 E-7	0.0069	11000
5	1.12 E-6	0.0095	14000
6	1.54 E-6	0.0122	16000
7	1.40 E-6	0.0151	18000
8	1.68 E-6	0.0182	20000
9	1.96 E-6	0.0218	22000
10	2.19 E-6	0.0260	24000
11	1.73 E-6	0.0299	26000
12	2.15 E-6	0.0338	28000
13	2.05 E-6	0.0380	30000
14	2.10 E-6	0.0421	32000
15	1.96 E-6	0.0462	34000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0016	1000
2	0.0039	5000
3	0.0053	9000
4	0.0084	13000
5	0.0106	15000
6	0.0137	17000
7	0.0165	19000
8	0.0199	21000
9	0.0238	23000
10	0.0282	25000
11	0.0316	27000
12	0.0359	29000
13	0.0400	31000
14	0.0442	33000
15	0.0482 (164)	35000

TABLE 66

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
TEMPERATURE DESICCATED AIR

SPECIMEN NO. 4-L-18, TENSION-ZERO  
F=12Hz,  $K_2=7.78$ , R=0.1,  $1/U=0$ , S=2.5

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.4780	0.0028	5000	1000	2.80 E-6
0.4799	0.0019	15000	10000	1.96 E-7
0.4813	0.0014	25000	10000	1.40 E-7
0.4816	0.0003	30000	5000	5.60 E-8
0.4824	0.0008	35000	5000	1.68 E-7
0.4833	0.0009	39000	4000	2.10 E-7
0.4844	0.0011	43000	4000	2.30 E-7
0.4861	0.0016	47000	4000	4.20 E-7
0.4866	0.0006	49000	2000	2.80 E-7
0.4875	0.0008	51000	2000	4.20 E-7
0.4889	0.0014	53000	2000	7.00 E-7
0.4900	0.0011	55000	2000	5.60 E-7
0.4914	0.0014	57000	2000	7.00 E-7
0.4948	0.0034	59000	2000	1.68 E-6
0.4967	0.0020	61000	2000	9.80 E-7
0.5004	0.0036	63000	2000	1.82 E-6
0.5051	0.0048	65000	2000	2.38 E-6
0.5090	0.0039	67000	2000	1.96 E-6
0.5121	0.0031	69000	2000	1.54 E-6
0.5160	0.0039	71000	2000	1.96 E-6
0.5191	0.0031	73000	2000	1.54 E-6
0.5236	0.0045	75000	2000	2.24 E-6
0.5281	0.0045	77000	2000	2.24 E-6
0.5323	0.0042	79000	2000	2.10 E-6
0.5368	0.0045	81000	2000	2.24 E-6
0.5407	0.0039	83000	2000	1.96 E-6

TABLE 66 (continued)

RUN NO. 2

0.5421	0.0014	84000	1000	1.40 E-6
0.5443	0.0022	94000	10000	2.24 E-7
0.5454	0.0011	104000	10000	1.12 E-7
0.5454	0.0000	109000	5000	0.00 E+0
0.5463	0.0008	114000	5000	1.68 E-7
0.5466	0.0003	118000	4000	7.00 E-8
0.5471	0.0006	122000	4000	1.40 E-7
0.5480	0.0008	126000	4000	2.10 E-7
0.5485	0.0006	128000	2000	2.80 E-7
0.5491	0.0006	130000	2000	2.80 E-7
0.5499	0.0008	132000	2000	4.20 E-7
0.5508	0.0003	134000	2000	4.20 E-7
0.5519	0.0011	136000	2000	5.60 E-7
0.5524	0.0006	138000	2000	2.80 E-7
0.5538	0.0014	140000	2000	7.00 E-7
0.5566	0.0028	142000	2000	1.40 E-6
0.5586	0.0020	144000	2000	9.80 E-7
0.5614	0.0028	146000	2000	1.40 E-6
0.5656	0.0042	148000	2000	2.10 E-6
0.5695	0.0039	150000	2000	1.96 E-6
0.5737	0.0042	152000	2000	2.10 E-6
0.5776	0.0039	154000	2000	1.96 E-6
0.5810	0.0034	156000	2000	1.68 E-6
0.5849	0.0039	158000	2000	1.96 E-6
0.5888	0.0039	160000	2000	1.96 E-6
0.5933	0.0045	162000	2000	2.24 E-6

TABLE 66 (continued)

RUN NO. 3

0.5958	0.0025	163000	1000	2.52 E-6
0.5975	0.0017	173000	10000	1.68 E-7
0.5998	0.0022	183000	10000	2.24 E-7
0.6003	0.0026	188000	5000	1.12 E-7
0.6012	0.0038	193000	5000	1.68 E-7
0.6014	0.0033	197000	4000	7.00 E-8
0.6017	0.0033	201000	4000	7.00 E-8
0.6020	0.0033	205000	4000	7.00 E-8
0.6026	0.0036	207000	2000	2.80 E-7
0.6031	0.0036	209000	2000	2.80 E-7
0.6037	0.0036	211000	2000	2.80 E-7
0.6045	0.0038	213000	2000	4.20 E-7
0.6054	0.0038	215000	2000	4.20 E-7
0.6073	0.0020	217000	2000	9.80 E-7
0.6093	0.0020	219000	2000	9.80 E-7
0.6126	0.0034	221000	2000	1.68 E-6
0.6168	0.0042	223000	2000	2.10 E-6
0.6199	0.0031	225000	2000	1.54 E-6
0.6238	0.0039	227000	2000	1.96 E-6
0.6289	0.0050	229000	2000	2.52 E-6
0.6322	0.0034	231000	2000	1.68 E-6
0.6353	0.0031	233000	2000	1.54 E-6
0.6404	0.0050	235000	2000	2.52 E-6
0.6440	0.0036	237000	2000	1.82 E-6
0.6482	0.0042	239000	2000	2.10 E-6
0.6518	0.0036	241000	2000	1.82 E-6

TABLE 66 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	2.24 E-6	0.0011	500
2	1.96 E-7	0.0032	6000
3	1.59 E-7	0.0050	16000
4	5.60 E-8	0.0059	23500
5	1.68 E-7	0.0065	28500
6	1.17 E-7	0.0071	33000
7	1.63 E-7	0.0077	37000
8	2.33 E-7	0.0085	41000
9	2.80 E-7	0.0092	44000
10	3.27 E-7	0.0098	46000
11	4.67 E-7	0.0106	48000
12	4.67 E-7	0.0115	50000
13	5.60 E-7	0.0126	52000
14	9.80 E-7	0.0141	54000
15	8.87 E-7	0.0160	56000
16	1.63 E-6	0.0185	58000
17	1.82 E-6	0.0220	60000
18	1.63 E-6	0.0254	62000
19	1.87 E-6	0.0289	64000
20	2.15 E-6	0.0329	66000
21	1.77 E-6	0.0368	68000
22	1.91 E-6	0.0405	70000
23	2.15 E-6	0.0446	72000
24	1.96 E-6	0.0487	74000
25	2.10 E-6	0.0528	76000
26	2.01 E-6	0.0569	78000

TABLE 66 (continued)

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0022	1000
2	0.0042	11000
3	0.0058	21000
4	0.0061	26000
5	0.0069	31000
6	0.0074	35000
7	0.0080	39000
8	0.0089	43000
9	0.0095	45000
10	0.0101	47000
11	0.0111	49000
12	0.0120	51000
13	0.0131	53000
14	0.0151	55000
15	0.0169	57000
16	0.0201	59000
17	0.0238	61000
18	0.0270	63000
19	0.0308	65000
20	0.0351	67000
21	0.0386	69000
22	0.0425	71000
23	0.0468	73000
24	0.0507	75000
25	0.0549	77000
26	0.0589	79000

TABLE 67

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 6-L-10, TENSION-ZERO  
 $F=12\text{Hz}$ ,  $K_2=7.78$ ,  $R=0.1$ ,  $1/U=0$ ,  $S=3.0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.8781	0.0022	8000	1000	2.24 E-6
0.8826	0.0045	33000	25000	1.79 E-7
0.8837	0.0011	41000	8000	1.40 E-7
0.8842	0.0006	49000	8000	7.00 E-8
0.8842	0.0000	57000	8000	0.00 E+0
0.8842	0.0000	65000	8000	0.00 E+0
0.8842	0.0000	73000	8000	0.00 E+0
0.8842	0.0000	81000	8000	0.00 E+0
0.8848	0.0006	89000	8000	7.00 E-8
0.8848	0.0000	97000	8000	0.00 E+0
0.8848	0.0000	105000	8000	0.00 E+0
0.8848	0.0000	113000	8000	0.00 E+0
0.8854	0.0006	121000	8000	7.00 E-8
0.8854	0.0000	129000	8000	0.00 E+0
0.8854	0.0000	137000	8000	0.00 E+0
0.8859	0.0006	145000	8000	7.00 E-8
0.8882	0.0022	153000	8000	2.80 E-7
0.8904	0.0022	155000	2000	1.12 E-6
0.8932	0.0028	157000	2000	1.40 E-6
0.8971	0.0039	159000	2000	1.96 E-6
0.9005	0.0034	161000	2000	1.68 E-6
0.9106	0.0101	163000	2000	5.04 E-6
0.9195	0.0090	165000	2000	4.48 E-6
0.9262	0.0067	167000	2000	3.36 E-6
0.9307	0.0045	169000	2000	2.24 E-6
0.9374	0.0067	171000	2000	3.36 E-6
0.9436	0.0062	173000	2000	3.08 E-6
0.9498	0.0062	175000	2000	3.08 E-6
0.9554	0.0056	177000	2000	2.80 E-6

TABLE 67 (cont'd)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	2.24 E-6	0.0011	500
2	1.79 E-7	0.0045	13500
3	1.40 E-7	0.0073	30000
4	7.00 E-8	0.0081	38000
5	0.00 E+0	0.0084	46000
6	0.00 E+0	0.0084	54000
7	0.00 E+0	0.0084	62000
8	0.00 E+0	0.0084	70000
9	7.00 E-8	0.0087	78000
10	0.00 E+0	0.0090	86000
11	0.00 E+0	0.0090	94000
12	0.00 E+0	0.0090	102000
13	7.00 E-8	0.0092	110000
14	0.00 E+0	0.0095	118000
15	0.00 E+0	0.0095	126000
16	7.00 E-8	0.0098	134000
17	2.80 E-7	0.0112	142000
18	1.12 E-6	0.0134	147000
19	1.40 E-6	0.0160	149000
20	1.96 E-6	0.0193	151000
21	1.68 E-6	0.0230	153000
22	5.04 E-6	0.0297	155000
23	4.48 E-6	0.0392	157000
24	3.36 E-6	0.0470	159000
25	2.24 E-6	0.0526	161000
26	3.36 E-6	0.0582	163000
27	3.08 E-6	0.0647	165000
28	3.08 E-6	0.0708	167000
29	2.80 E-6	0.0767	169000



TABLE 67 (cont'd)

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0022	1000
2	0.0067	26000
3	0.0078	34000
4	0.0084	42000
5	0.0084	50000
6	0.0084	58000
7	0.0084	66000
8	0.0084	74000
9	0.0090	82000
10	0.0090	90000
11	0.0090	98000
12	0.0090	106000
13	0.0095	114000
14	0.0095	122000
15	0.0095	130000
16	0.0101	138000
17	0.0123	146000
18	0.0146	148000
19	0.0174	150000
20	0.0213	152000
21	0.0246	154000
22	0.0347	156000
23	0.0437	158000
24	0.0504	160000
25	0.0549	162000
26	0.0616	164000
27	0.0678	166000
28	0.0739	168000
29	0.0795	170000

Data adjusted to reflect growth of one crack tip.

TABLE 68

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 6-L-10, TENSION-ZERO  
 F=12Hz,  $K_2=7.78$ , R=0.1, 1/U=0, S=3.1

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.0548	0.0034	92000	1000	3.36 E-6
1.0567	0.0020	117000	25000	7.84 E-8
1.0570	0.0003	142000	25000	1.12 E-8
1.0573	0.0003	167000	25000	1.12 E-8
1.0576	0.0003	192000	25000	1.12 E-8
1.0576	0.0000	217000	25000	0.00 E+0
1.0576	0.0000	242000	25000	0.00 E+0
1.0590	0.0014	267000	25000	5.60 E-8
1.0595	0.0006	292000	25000	2.24 E-8
1.0853	0.0258	317000	25000	1.03 E-6

Test performed to zero-in on overload shut-off ratio. Test terminated prior to reaching  $(da/dN)_c$ .

TABLE 69

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 6-L-10, TENSION-ZERO  
 $F=12\text{Hz}$ ,  $K_2=7.78$ ,  $R=0.1$ ,  $1/U=0$ ,  $S=3.2$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.4199	0.0034	2000	1000	3.36 E-6
1.4224	0.0025	27000	25000	1.01 E-7
1.4227	0.0003	52000	25000	1.12 E-8
1.4227	0.0000	77000	25000	0.00 E+0
1.4235	0.0008	102000	25000	3.36 E-8
1.4235	0.0000	127000	25000	0.00 E+0
1.4235	0.0000	152000	25000	0.00 E+0
1.4235	0.0000	177000	25000	0.00 E+0
1.4235	0.0000	202000	25000	0.00 E+0
1.4235	0.0000	227000	25000	0.00 E+0
1.4252	0.0017	252000	25000	6.72 E-8
1.4386	0.0134	277000	25000	5.38 E-7

Test performed to zero-in on overload shut-off ratio. Test terminated prior to reaching  $(da/dN)_c$ .

TABLE 70

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 6-L-10, TENZION-ZERO  
 F=12Hz,  $K_2=7.78$ , R=0.1, 1/U=0, S=3.3

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.5481	0.0031	40000	1000	3.08 E-6
1.5501	0.0020	65000	25000	7.84 E-8
1.5501	0.0000	90000	25000	0.00 E+0
1.5501	0.0000	115000	25000	0.00 E+0
1.5501	0.0000	140000	25000	0.00 E+0
1.5501	0.0000	165000	25000	0.00 E+0
1.5501	0.0000	190000	25000	0.00 E+0
1.5501	0.0000	215000	25000	0.00 E+0
1.5501	0.0000	240000	25000	0.00 E+0
1.5501	0.0000	265000	25000	0.00 E+0
1.5501	0.0000	290000	25000	0.00 E+0
1.5501	0.0000	315000	25000	0.00 E+0
1.5501	0.0000	340000	25000	0.00 E+0
1.5501	0.0000	365000	25000	0.00 E+0
1.5501	0.0000	390000	25000	0.00 E+0
1.5501	0.0000	415000	25000	0.00 E+0
1.5501	0.0000	440000	25000	0.00 E+0
1.5512	0.0011	465000	25000	4.48 E-8
1.5537	0.0025	477500	12500	2.02 E-7
1.5630	0.0092	482500	5000	1.85 E-6

Test performed to zero-in on overload shut-off ratio. Test terminated prior to reaching  $(da/dN)_c$ .

TABLE 71  
EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
TEMPERATURE DESICCATED AIR  
SPECIMEN NO. 5-L-3, TENSION-ZERO  
F=12Hz,  $K_2=7.78$ , R=0.1, 1/U=0, S=3.4

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.4530	0.0017	6000	1000	1.68 E-6
0.4564	0.0034	31000	25000	1.34 E-7
0.4575	0.0011	56000	25000	4.48 E-8
0.4586	0.0011	81000	25000	4.48 E-8
0.4586	0.0000	106000	25000	0.00 E+0
0.4586	0.0000	131000	25000	0.00 E+0
0.4586	0.0000	156000	25000	0.00 E+0
0.4586	0.0000	181000	25000	0.00 E+0
0.4586	0.0000	206000	25000	0.00 E+0
0.4586	0.0000	231000	25000	0.00 E+0
0.4586	0.0000	256000	25000	0.00 E+0
0.4586	0.0000	281000	25000	0.00 E+0
0.4586	0.0000	306000	25000	0.00 E+0
0.4586	0.0000	331000	25000	0.00 E+0
0.4586	0.0000	356000	25000	0.00 E+0
0.4586	0.0000	381000	25000	0.00 E+0
0.4586	0.0000	406000	25000	0.00 E+0
0.4586	0.0000	431000	25000	0.00 E+0
0.4586	0.0000	456000	25000	0.00 E+0
0.4586	0.0000	481000	25000	0.00 E+0
0.4586	0.0000	506000	25000	0.00 E+0
0.4586	0.0000	531000	25000	0.00 E+0
0.4586	0.0000	556000	25000	0.00 E+0
0.4586	0.0000	581000	25000	0.00 E+0
0.4586	0.0000	606000	25000	0.00 E+0
0.4586	0.0000	631000	25000	0.00 E+0
0.4586	0.0000	656000	25000	0.00 E+0
0.4586	0.0000	681000	25000	0.00 E+0
0.4586	0.0000	706000	25000	0.00 E+0

S=3.4 considered to be overload shut-off ratio for this case.

TABLE 72  
EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
TEMPERATURE DESICCATED AIR  
SPECIMEN NO. 6-L-20, TENSION-ZERO  
F=12Hz, K2=14, R=0.5, 1/U=0, S=1.5

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.4087	0.0045	5250	1250	3.58 E-6
1.4106	0.0020	6250	1000	1.96 E-6
1.4137	0.0031	7250	1000	3.08 E-6
1.4174	0.0036	8250	1000	3.64 E-6
1.4216	0.0042	9250	1000	4.20 E-6
1.4263	0.0048	10250	1000	4.76 E-6
1.4294	0.0031	11250	1000	3.08 E-6
1.4336	0.0042	12250	1000	4.20 E-6
1.4384	0.0048	13250	1000	4.76 E-6
1.4420	0.0036	14250	1000	3.64 E-6
1.4459	0.0039	15250	1000	3.92 E-6
RUN NO. 2				
1.4498	0.0039	16500	1250	3.14 E-6
1.4521	0.0022	17500	1000	2.24 E-6
1.4566	0.0045	18500	1000	4.48 E-6
1.4605	0.0039	19500	1000	3.92 E-6
1.4636	0.0031	20500	1000	3.08 E-6
1.4672	0.0036	21500	1000	3.64 E-6
1.4714	0.0042	22500	1000	4.20 E-6
1.4756	0.0042	23500	1000	4.20 E-6
1.4798	0.0042	24500	1000	4.20 E-6
1.4843	0.0045	25500	1000	4.48 E-6
1.4888	0.0045	26500	1000	4.48 E-6
RUN NO. 3				
1.4918	0.0031	27750	1250	2.46 E-6
1.4949	0.0031	28750	1000	3.08 E-6
1.4974	0.0025	29750	1000	2.52 E-6
1.5016	0.0042	30750	1000	4.20 E-6
1.5058	0.0042	31750	1000	4.20 E-6
1.5109	0.0050	32750	1000	5.04 E-6
1.5151	0.0042	33750	1000	4.20 E-6
1.5193	0.0042	34750	1000	4.20 E-6
1.5229	0.0036	35750	1000	3.64 E-6
1.5277	0.0048	36750	1000	4.76 E-6
1.5319	0.0042	37750	1000	4.20 E-6

TABLE 72 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	3.06 E-6	0.0019	625
2	2.43 E-6	0.0050	1750
3	3.36 E-6	0.0079	2750
4	3.92 E-6	0.0116	3750
5	3.83 E-6	0.0154	4750
6	4.48 E-6	0.0196	5750
7	3.83 E-6	0.0238	6750
8	4.20 E-6	0.0278	7750
9	4.20 E-6	0.0320	8750
10	4.29 E-6	0.0362	9750
11	4.20 E-6	0.0405	10750

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0038	1250
2	0.0063	2250
3	0.0096	3250
4	0.0135	4250
5	0.0174	5250
6	0.0218	6250
7	0.0257	7250
8	0.0299	8250
9	0.0341	9250
10	0.0384	10250
11	0.0426	11250

TABLE 73  
EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
TEMPERATURE DESICCATED AIR  
SPECIMEN NO. 2-L-9, TENSION-ZERO  
F=12Hz, K<sub>2</sub>=14, R=0.5, 1/U=0, S=2.0.

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.5046	0.0034	29750	1000	3.36 E-6
0.5082	0.0036	33750	4000	9.10 E-7
0.5135	0.0053	37750	4000	1.33 E-6
0.5219	0.0084	41750	4000	2.10 E-6
0.5267	0.0048	43750	2000	2.38 E-6
0.5292	0.0025	44750	1000	2.52 E-6
0.5328	0.0036	45750	1000	3.64 E-6
0.5359	0.0031	46750	1000	3.08 E-6
0.5393	0.0034	47750	1000	3.36 E-6
0.5432	0.0039	48750	1000	3.92 E-6
0.5474	0.0042	49750	1000	4.20 E-6
0.5505	0.0031	50750	1000	3.08 E-6
0.5541	0.0036	51750	1000	3.64 E-6
0.5580	0.0039	52750	1000	3.92 E-6
0.5620	0.0039	53750	1000	3.92 E-6
0.5667	0.0048	54750	1000	4.76 E-6
0.5715	0.0048	55750	1000	4.76 E-6
0.5748	0.0034	56750	1000	3.36 E-6
RUN NO. 2				
0.5776	0.0028	57750	1000	2.80 E-6
0.5816	0.0039	61750	4000	9.80 E-7
0.5852	0.0036	65750	4000	9.10 E-7
0.5919	0.0067	69750	4000	1.68 E-6
0.5958	0.0039	71750	2000	1.96 E-6
0.5984	0.0025	72750	1000	2.52 E-6
0.6017	0.0034	73750	1000	3.36 E-6
0.6045	0.0028	74750	1000	2.80 E-6
0.6076	0.0031	75750	1000	3.08 E-6
0.6112	0.0036	76750	1000	3.64 E-6
0.6149	0.0036	77750	1000	3.64 E-6
0.6177	0.0028	78750	1000	2.80 E-6
0.6219	0.0042	79750	1000	4.20 E-6
0.6261	0.0042	80750	1000	4.20 E-6
0.6300	0.0039	81750	1000	3.92 E-6
0.6342	0.0042	82750	1000	4.20 E-6
0.6373	0.0031	83750	1000	3.08 E-6
0.6415	0.0042	84750	1000	4.20 E-6



TABLE 73 (continued)

RUN NO. 3

0.6454	0.0039	85750	1000	3.92 E-6
0.6490	0.0036	89750	4000	9.10 E-7
0.6535	0.0045	93750	4000	1.12 E-6
0.6586	0.0050	97750	4000	1.26 E-6
0.6608	0.0022	99750	2000	1.12 E-6
0.6636	0.0028	100750	1000	2.80 E-6
0.6656	0.0020	101750	1000	1.96 E-6
0.6681	0.0025	102750	1000	2.52 E-6
0.6720	0.0039	103750	1000	3.92 E-6
0.6740	0.0020	104750	1000	1.96 E-6
0.6768	0.0028	105750	1000	2.80 E-6
0.6812	0.0045	106750	1000	4.48 E-6
0.6846	0.0034	107750	1000	3.36 E-6
0.6891	0.0045	108750	1000	4.48 E-6
0.6936	0.0045	109750	1000	4.48 E-6
0.6978	0.0042	110750	1000	4.20 E-6
0.7031	0.0053	111750	1000	5.32 E-6
0.7067	0.0036	112750	1000	3.64 E-6

TABLE 73 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	3.36 E-6	0.0017	500
2	9.33 E-7	0.0052	3000
3	1.12 E-6	0.0093	7000
4	1.68 E-6	0.0149	11000
5	1.82 E-6	0.0201	14000
6	2.61 E-6	0.0232	15500
7	2.99 E-6	0.0260	16500
8	2.80 E-6	0.0289	17500
9	3.45 E-6	0.0321	18500
10	3.17 E-6	0.0354	19500
11	3.55 E-6	0.0387	20500
12	3.45 E-6	0.0422	21500
13	3.73 E-6	0.0458	22500
14	4.20 E-6	0.0498	23500
15	4.11 E-6	0.0539	24500
16	4.39 E-6	0.0582	25500
17	4.39 E-6	0.0626	26500
18	3.73 E-6	0.0666	27500

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0034	1000
2	0.0071	5000
3	0.0116	9000
4	0.0183	13000
5	0.0219	15000
6	0.0245	16000
7	0.0275	17000
8	0.0303	18000
9	0.0338	19000
10	0.0370	20000
11	0.0405	21000
12	0.0440	22000
13	0.0477	23000
14	0.0519	24000
15	0.0560	25000
16	0.0604	26000
17	0.0648	27000
18	0.0685	28000

TABLE 74

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 5-L-3, TENSION - ZERO  
 $F=12\text{Hz}$ ,  $K_2=14$ ,  $R=0.5$ ,  $1/U=0$ ,  $S=2.5$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.8893	0.0034	3000	1000	3.36 E-6
0.8954	0.0062	15000	12000	5.13 E-7
0.8960	0.0006	27000	12000	4.67 E-8
0.8988	0.0028	39000	12000	2.33 E-7
0.9005	0.0017	51000	12000	1.40 E-7
0.9005	0.0000	63000	12000	0.00 E+0
0.9038	0.0034	75000	12000	2.80 E-7
0.9072	0.0034	87000	12000	2.80 E-7
0.9094	0.0022	99000	12000	1.87 E-7
0.9150	0.0056	111000	12000	4.67 E-7
0.9274	0.0123	123000	12000	1.03 E-6
0.9548	0.0274	135000	12000	2.29 E-6
0.9744	0.0196	140750	5750	3.41 E-6
0.9890	0.0146	146750	6000	2.43 E-6
0.9990	0.0101	149750	3000	3.36 E-6
1.0024	0.0034	150750	1000	3.36 E-6
1.0069	0.0045	151750	1000	4.48 E-6
1.0097	0.0028	152750	1000	2.80 E-6
1.0130	0.0034	153750	1000	3.36 E-6
1.0175	0.0045	154750	1000	4.48 E-6
1.0203	0.0028	155750	1000	2.80 E-6
1.0226	0.0022	156750	1000	2.24 E-6
1.0265	0.0039	157750	1000	3.92 E-6
1.0304	0.0039	158750	1000	3.92 E-6
1.0343	0.0039	159750	1000	3.92 E-6
1.0382	0.0039	160750	1000	3.92 E-3

TABLE 74 (cont'd)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	3.36 E-6	0.0017	500
2	5.13 E-7	0.0064	7000
3	4.67 E-8	0.0098	19000
4	2.33 E-7	0.0115	31000
5	1.40 E-7	0.0137	43000
6	0.00 E+0	0.0146	55000
7	2.80 E-7	0.0162	67000
8	2.80 E-7	0.0196	79000
9	1.87 E-7	0.0224	91000
10	4.67 E-7	0.0263	103000
11	1.03 E-6	0.0353	115000
12	2.29 E-6	0.0552	127000
13	3.41 E-6	0.0787	135875
14	2.43 E-6	0.0958	141750
15	3.36 E-6	0.1081	146250
16	3.36 E-6	0.1148	148250
17	4.48 E-6	0.1187	149250
18	2.80 E-6	0.1224	150250
19	3.36 E-6	0.1254	151250
20	4.48 E-6	0.1294	152250
21	2.80 E-6	0.1330	153250
22	2.24 E-6	0.1355	154250
23	3.92 E-6	0.1386	155250
24	3.92 E-6	0.1425	156250
25	3.92 E-6	0.1464	157250
26	3.92 E-3	0.1504	158250

TABLE 74 (cont'd)

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0034	1000
2	0.0095	13000
3	0.0101	25000
4	0.0129	37000
5	0.0146	49000
6	0.0146	61000
7	0.0179	73000
8	0.0213	85000
9	0.0235	97000
10	0.0291	109000
11	0.0414	121000
12	0.0689	133000
13	0.0885	138750
14	0.1030	144750
15	0.1131	147750
16	0.1165	148750
17	0.1210	149750
18	0.1238	150750
19	0.1271	151750
20	0.1316	152750
21	0.1344	153750
22	0.1366	154750
23	0.1406	155750
24	0.1445	156750
25	0.1484	157750
26	0.1523	158750

Data adjusted to reflect growth of one crack tip.

TABLE 75  
EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
TEMPERATURE DESICCATED AIR  
SPECIMEN NO. 5-L-3, TENSION-ZERO  
F=12Hz,  $K_2=14$ , R=0.5, 1/U=0, S=2.7

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.1326	0.0020	7000	1000	1.96 E-6
1.1413	0.0037	32000	25000	3.47 E-7
1.1424	0.0011	57000	25000	4.48 E-8
1.1466	0.0042	82000	25000	1.68 E-7
1.1480	0.0014	107000	25000	5.60 E-8
1.1505	0.0025	132000	25000	1.01 E-7
1.1542	0.0036	157000	25000	1.46 E-7
1.1564	0.0022	182000	25000	8.96 E-8
1.1586	0.0022	207000	25000	8.96 E-8
1.1659	0.0073	232000	25000	2.91 E-7
1.1743	0.0084	240000	8000	1.05 E-6
1.1866	0.0123	248000	8000	1.54 E-6
1.2023	0.0157	256000	8000	1.96 E-6
1.2174	0.0151	264000	8000	1.89 E-6

Test performed to zero-in on overload shut-off ratio. Test terminated prior to reaching  $(da/dN)_c$ .

TABLE 76  
EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
TEMPERATURE DESICCATED AIR  
SPECIMEN NO. 5-L-3, TENSION-ZERO  
F=12Hz,  $K_2=14$ , R=0.5, 1/U=0, S=2.8

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.3317	0.0042	6000	1000	4.20 E-6
1.3378	0.0062	31000	25000	2.46 E-7
1.3418	0.0039	56000	25000	1.57 E-7
1.3423	0.0006	81000	25000	2.24 E-8
1.3429	0.0006	106000	25000	2.24 E-8
1.3434	0.0006	131000	25000	2.24 E-8
1.3434	0.0000	156000	25000	0.00 E+0
1.3434	0.0000	181000	25000	0.00 E+0
1.3434	0.0000	206000	25000	0.00 E+0
1.3468	0.0034	231000	25000	1.34 E-7
1.3474	0.0006	256000	25000	2.24 E-8
1.3488	0.0014	281000	25000	5.60 E-8
1.3499	0.0011	306000	25000	4.48 E-8
1.3518	0.0020	331000	25000	7.84 E-8
1.3518	0.0000	356000	25000	0.00 E+0
1.3518	0.0000	381000	25000	0.00 E+0
1.3535	0.0017	406000	25000	6.72 E-8
1.3538	0.0003	431000	25000	1.12 E-8
1.3538	0.0000	456000	25000	0.00 E+0
1.3541	0.0003	481000	25000	1.12 E-8
1.3541	0.0000	506000	25000	0.00 E+0
1.3541	0.0000	531000	25000	0.00 E+0
1.3541	0.0000	556000	25000	0.00 E+0
1.3541	0.0000	581000	25000	0.00 E+0
1.3541	0.0000	606000	25000	0.00 E+0
1.3546	0.0006	631000	25000	2.24 E-8
1.3558	0.0011	656000	25000	4.48 E-8
1.3563	0.0006	681000	25000	2.24 E-8
1.3574	0.0011	706000	25000	4.48 E-8

Test performed to zero-in on overload shut-off ratio. Test terminated prior to reaching  $(da/dN)_c$ .

TABLE 77

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 5-L-10, TENSION-ZERO  
 $F=12\text{Hz}$ ,  $K_2=14$ ,  $R=0.5$ ,  $1/U=0$ ,  $S=2.9$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.9680	0.0050	3000	1000	5.04 E-6
0.9761	0.0081	28000	25000	3.25 E-7
0.9811	0.0050	53000	25000	2.02 E-7
0.9842	0.0031	78000	25000	1.23 E-7
0.9859	0.0017	103000	25000	6.72 E-8
0.9878	0.0020	128000	25000	7.84 E-8
0.9906	0.0028	153000	25000	1.12 E-7
0.9943	0.0036	178000	25000	1.46 E-7
0.9965	0.0022	203000	25000	8.96 E-8
0.9979	0.0014	228000	25000	5.60 E-8
0.9999	0.0020	253000	25000	7.84 E-8
1.0027	0.0028	278000	25000	1.12 E-7
1.0060	0.0034	303000	25000	1.34 E-7
1.0091	0.0031	328000	25000	1.23 E-7
1.0119	0.0028	353000	25000	1.12 E-7
1.0203	0.0084	378000	25000	3.36 E-7
1.0360	0.0157	403000	25000	6.27 E-7
1.0606	0.0246	428000	25000	9.86 E-7
1.0758	0.0151	441000	13000	1.16 E-6
1.0822	0.0064	446000	5000	1.29 E-6
1.0886	0.0064	451000	5000	1.29 E-6

Test performed to zero-in on overload shut-off ratio. Test terminated prior to reaching  $(da/dN)_c$ .



TABLE 78

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 5-L-10, TENSION-ZERO  
 $F=12\text{Hz}$ ,  $K_2=14$ ,  $R=0.5$ ,  $1/U=0$ ,  $S=3.0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.3664	0.0028	2000	1000	2.80 E-6
1.3737	0.0073	27000	25000	2.91 E-7
1.3787	0.0050	52000	25000	2.02 E-7
1.3787	0.0000	77000	25000	0.00 E+0
1.3807	0.0020	102000	25000	7.84 E-8
1.3818	0.0011	127000	25000	4.48 E-8
1.3824	0.0006	152000	25000	2.24 E-8
1.3832	0.0008	177000	25000	3.36 E-8
1.3832	0.0000	202000	25000	0.00 E+0
1.3832	0.0000	227000	25000	0.00 E+0
1.3832	0.0000	252000	25000	0.00 E+0
1.3832	0.0000	277000	25000	0.00 E+0
1.3832	0.0000	302000	25000	0.00 E+0
1.3832	0.0000	327000	25000	0.00 E+0
1.3838	0.0006	352000	25000	2.24 E-8
1.3838	0.0000	377000	25000	0.00 E+0
1.3838	0.0000	402000	25000	0.00 E+0
1.3838	0.0000	427000	25000	0.00 E+0
1.3838	0.0000	452000	25000	0.00 E+0
1.3838	0.0000	477000	25000	0.00 E+0
1.3838	0.0000	502000	25000	0.00 E+0
1.3838	0.0000	527000	25000	0.00 E+0
1.3838	0.0000	552000	25000	0.00 E+0
1.3838	0.0000	577000	25000	0.00 E+0
1.3838	0.0000	602000	25000	0.00 E+0
1.3838	0.0000	627000	25000	0.00 E+0
1.3838	0.0000	652000	25000	0.00 E+0
1.3838	0.0000	677000	25000	0.00 E+0
1.3838	0.0000	702000	25000	0.00 E+0

$S=3.0$  considered to be overload shut-off ratio for this case.

Data Tabulations for Zero-Tension Load Class,  
 $K_2=10 \text{ KSI } \sqrt{\text{In.}}$

TABLE 79

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 2-L-10, ZERO-TENSION  
 F=12Hz, K2=10, R=0.3, 1/U=0, S=1.5

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.5488	0.0028	20000	1000	2.80 E-6
0.5494	0.0006	21000	1000	5.60 E-7
0.5510	0.0017	22000	1000	1.68 E-6
0.5527	0.0017	23000	1000	1.68 E-6
0.5561	0.0034	24000	1000	3.36 E-6
0.5583	0.0022	25000	1000	2.24 E-6
0.5617	0.0034	26000	1000	3.36 E-6
0.5645	0.0028	27000	1000	2.80 E-6
0.5678	0.0034	28000	1000	3.36 E-6
0.5712	0.0034	29000	1000	3.36 E-6
0.5746	0.0034	30000	1000	3.36 E-6
0.5779	0.0034	31000	1000	3.36 E-6
RUN NO. 2				
0.5818	0.0039	32000	1000	3.92 E-6
0.5824	0.0006	33000	1000	5.60 E-7
0.5835	0.0011	34000	1000	1.12 E-6
0.5852	0.0017	35000	1000	1.68 E-6
0.5880	0.0028	36000	1000	2.80 E-6
0.5908	0.0028	37000	1000	2.80 E-6
0.5942	0.0034	38000	1000	3.36 E-6
0.5975	0.0034	39000	1000	3.36 E-6
0.6003	0.0028	40000	1000	2.80 E-6
0.6042	0.0039	41000	1000	3.92 E-6
0.6076	0.0034	42000	1000	3.36 E-6
0.6115	0.0039	43000	1000	3.92 E-6
RUN NO. 3				
0.6143	0.0028	44000	1000	2.80 E-6
0.6160	0.0017	45000	1000	1.68 E-6
0.6171	0.0011	46000	1000	1.12 E-6
0.6188	0.0017	47000	1000	1.68 E-6
0.6210	0.0022	48000	1000	2.24 E-6
0.6238	0.0028	49000	1000	2.80 E-6
0.6266	0.0028	50000	1000	2.80 E-6
0.6311	0.0045	51000	1000	4.48 E-6
0.6345	0.0034	52000	1000	3.36 E-6
0.6390	0.0045	53000	1000	4.48 E-6
0.6418	0.0028	54000	1000	2.80 E-6
0.6457	0.0039	55000	1000	3.92 E-6

TABLE 79 (continued)

RUN NO. 4

0.6479	0.0022	56000	1000	2.24 E-6
0.6496	0.0017	57000	1000	1.68 E-6
0.6513	0.0017	58000	1000	1.68 E-6
0.6530	0.0017	59000	1000	1.68 E-6
0.6563	0.0034	60000	1000	3.36 E-6
0.6602	0.0039	61000	1000	3.92 E-6
0.6625	0.0022	62000	1000	2.24 E-6
0.6658	0.0034	63000	1000	3.36 E-6
0.6698	0.0039	64000	1000	3.92 E-6
0.6737	0.0039	65000	1000	3.92 E-6
0.6776	0.0039	66000	1000	3.92 E-6
0.6810	0.0034	67000	1000	3.26 E-6

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	2.94 E-6	0.0015	500
2	1.12 E-6	0.0035	1500
3	1.40 E-6	0.0048	2500
4	1.68 E-6	0.0063	3500
5	2.94 E-6	0.0086	4500
6	2.94 E-6	0.0116	5500
7	2.94 E-6	0.0145	6500
8	3.50 E-6	0.0177	7500
9	3.36 E-6	0.0211	8500
10	3.92 E-6	0.0248	9500
11	3.36 E-6	0.0284	10500
12	3.64 E-6	0.0319	11500

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0029	1000
2	0.0041	2000
3	0.0055	3000
4	0.0071	4000
5	0.0101	5000
6	0.0130	6000
7	0.0160	7000
8	0.0195	8000
9	0.0228	9000
10	0.0267	10000
11	0.0301	11000
12	0.0337	12000

TABLE 80

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 2-L-10, ZERO-TENSION  
 F=12Hz, K2=10, R=0.5, 1/U=0, S=1.5

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.7319	0.0011	53000	1000	1.12 E-6
0.7319	0.0030	55000	2000	0.00 E+0
0.7330	0.0012	57000	2000	5.60 E-7
0.7336	0.0006	59000	2000	2.80 E-7
0.7353	0.0017	61000	2000	8.40 E-7
0.7375	0.0022	63000	2000	1.12 E-6
0.7392	0.0017	65000	2000	8.40 E-7
0.7426	0.0034	67000	2000	1.68 E-6
0.7454	0.0028	69000	2000	1.40 E-6
0.7493	0.0039	71000	2000	1.96 E-6
0.7521	0.0028	73000	2000	1.40 E-6
0.7538	0.0017	75000	2000	8.40 E-7
0.7560	0.0022	77000	2000	1.12 E-6
0.7583	0.0028	79000	2000	1.40 E-6
0.7610	0.0022	81000	2000	1.12 E-6
RUN NO. 2				
0.7622	0.0011	82000	1000	1.12 E-6
0.7627	0.0006	84000	2000	2.80 E-7
0.7633	0.0006	86000	2000	2.80 E-7
0.7644	0.0011	88000	2000	5.60 E-7
0.7655	0.0011	90000	2000	5.60 E-7
0.7683	0.0028	92000	2000	1.40 E-6
0.7700	0.0017	94000	2000	8.40 E-7
0.7728	0.0028	96000	2000	1.40 E-6
0.7762	0.0034	98000	2000	1.68 E-6
0.7778	0.0017	100000	2000	8.40 E-7
0.7806	0.0028	102000	2000	1.40 E-6
0.7829	0.0022	104000	2000	1.12 E-6
0.7851	0.0022	106000	2000	1.12 E-6
0.7879	0.0028	108000	2000	1.40 E-6
0.7896	0.0017	110000	2000	8.40 E-7

TABLE 80 (continued)

## RUN NO. 3

0.7902	0.0006	111000	1000	5.60 E-7
0.7907	0.0006	113000	2000	2.80 E-7
0.7918	0.0011	115000	2000	5.60 E-7
0.7930	0.0011	117000	2000	5.60 E-7
0.7946	0.0017	119000	2000	8.40 E-7
0.7974	0.0028	121000	2000	1.40 E-6
0.7997	0.0022	123000	2000	1.12 E-6
0.8019	0.0022	125000	2000	1.12 E-6
0.8047	0.0028	127000	2000	1.40 E-6
0.8075	0.0028	129000	2000	1.40 E-6
0.8092	0.0017	131000	2000	8.40 E-7
0.8114	0.0022	133000	2000	1.12 E-6
0.8137	0.0022	135000	2000	1.12 E-6
0.8165	0.0028	137000	2000	1.40 E-6
0.8187	0.0022	139000	2000	1.12 E-6

## RUN NO. 4

0.8198	0.0011	140000	1000	1.12 E-6
0.8204	0.0006	142000	2000	2.80 E-7
0.8210	0.0006	144000	2000	2.80 E-7
0.8226	0.0017	146000	2000	8.40 E-7
0.8238	0.0011	148000	2000	5.60 E-7
0.8260	0.0022	150000	2000	1.12 E-6
0.8288	0.0028	152000	2000	1.40 E-6
0.8310	0.0022	154000	2000	1.12 E-6
0.8333	0.0022	156000	2000	1.12 E-6
0.8355	0.0022	158000	2000	1.12 E-6
0.8383	0.0028	160000	2000	1.40 E-6
0.8406	0.0022	162000	2000	1.12 E-6
0.8428	0.0022	164000	2000	1.12 E-6
0.8450	0.0022	166000	2000	1.12 E-6
0.8473	0.0022	168000	2000	1.12 E-6

TABLE 80 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	9.80 E-7	0.0035	500
2	2.10 E-7	0.0012	2000
3	4.20 E-7	0.0018	4000
4	5.60 E-7	0.0028	6000
5	7.00 E-7	0.0041	8000
6	1.26 E-6	0.0061	10000
7	1.25 E-6	0.0084	12000
8	1.33 E-6	0.0107	14000
9	1.40 E-6	0.0135	16000
10	1.33 E-6	0.0162	18000
11	1.26 E-6	0.0188	20000
12	1.05 E-6	0.0211	22000
13	1.12 E-6	0.0233	24000
14	1.33 E-6	0.0257	26000
15	1.05 E-6	0.0281	28000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0010	1000
2	0.0014	3000
3	0.0023	5000
4	0.0034	7000
5	0.0048	9000
6	0.0073	11000
7	0.0094	13000
8	0.0121	15000
9	0.0149	17000
10	0.0175	19000
11	0.0201	21000
12	0.0222	23000
13	0.0244	25000
14	0.0271	27000
15	0.0292	29000

TABLE 81

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 2-L-10, ZERO-TENSION  
 F=12Hz, K2=10, R=0.3, 1/u=0, S=2.0

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.8915	0.0028	27000	1000	2.80 E-6
0.8926	0.0012	29000	2000	5.60 E-7
0.8938	0.0012	31000	2000	5.60 E-7
0.8943	0.0006	33000	2000	2.80 E-7
0.8949	0.0006	35000	2000	2.80 E-7
0.8954	0.0006	37000	2000	2.80 E-7
0.8966	0.0012	39000	2000	5.60 E-7
0.8982	0.0017	41000	2000	8.40 E-7
0.9005	0.0022	43000	2000	1.12 E-6
0.9033	0.0028	45000	2000	1.40 E-6
0.9078	0.0045	47000	2000	2.24 E-6
0.9150	0.0073	49000	2000	3.64 E-6
0.9240	0.0090	51000	2000	4.48 E-6
0.9296	0.0056	53000	2000	2.80 E-6
0.9363	0.0067	55000	2000	3.36 E-6
0.9447	0.0084	57000	2000	4.20 E-6
0.9509	0.0062	59000	2000	3.08 E-6
RUN NO. 2				
0.9548	0.0039	60000	1000	3.92 E-6
0.9565	0.0017	62000	2000	8.40 E-7
0.9565	0.0000	64000	2000	0.00 E+0
0.9570	0.0006	66000	2000	2.80 E-7
0.9582	0.0011	68000	2000	5.60 E-7
0.9587	0.0006	70000	2000	2.80 E-7
0.9598	0.0011	72000	2000	5.60 E-7
0.9613	0.0011	74000	2000	5.60 E-7
0.9626	0.0017	76000	2000	8.40 E-7
0.9654	0.0023	78000	2000	1.40 E-6
0.9705	0.0050	80000	2000	2.52 E-6
0.9744	0.0039	82000	2000	1.96 E-6
0.9836	0.0062	84000	2000	3.08 E-6
0.9862	0.0056	86000	2000	2.80 E-6
0.9946	0.0084	88000	2000	4.20 E-6
1.0027	0.0062	90000	2000	3.08 E-6
1.0069	0.0062	92000	2000	3.08 E-6



TABLE 81 (continued)

## RUN NO. 3

1.0091	0.0022	93300	1000	2.24 E-6
1.0097	0.0036	95000	2000	2.80 E-7
1.0097	0.0000	97000	2000	0.00 E+3
1.0102	0.0036	99000	2000	2.80 E-7
1.0114	0.0011	101000	2000	5.60 E-7
1.0125	0.0011	103000	2000	5.60 E-7
1.0130	0.0036	105000	2000	2.80 E-7
1.0153	0.0022	107000	2000	1.12 E-6
1.0175	0.0022	109000	2000	1.12 E-6
1.0192	0.0017	111000	2000	8.40 E-7
1.0220	0.0026	113000	2000	1.40 E-6
1.0287	0.0067	115000	2000	3.36 E-6
1.0349	0.0062	117000	2000	3.08 E-6
1.0427	0.0078	119000	2000	3.92 E-6
1.0500	0.0073	121000	2000	3.64 E-6
1.0567	0.0067	123000	2000	3.36 E-6
1.0629	0.0062	125000	2000	3.08 E-6

## RUN NO. 4

1.0662	0.0034	126000	1000	3.36 E-6
1.0679	0.0017	128000	2000	8.40 E-7
1.0685	0.0006	130000	2000	2.80 E-7
1.0690	0.0006	132000	2000	2.80 E-7
1.0696	0.0006	134000	2000	2.80 E-7
1.0702	0.0006	136000	2000	2.80 E-7
1.0707	0.0006	138000	2000	2.80 E-7
1.0724	0.0017	140000	2000	8.40 E-7
1.0735	0.0011	142000	2000	5.60 E-7
1.0758	0.0022	144000	2000	1.12 E-6
1.0802	0.0045	146000	2000	2.24 E-6
1.0847	0.0045	148000	2000	2.24 E-6
1.0920	0.0073	150000	2000	3.64 E-6
1.0987	0.0067	152000	2000	3.36 E-6
1.1066	0.0078	154000	2000	3.92 E-6
1.1155	0.0090	156000	2000	4.48 E-6
1.1217	0.0062	158000	2000	3.08 E-6

TABLE 81 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	3.08 E-6	0.0015	500
2	6.30 E-7	0.0037	2000
3	2.10 E-7	0.0046	4000
4	2.80 E-7	0.0051	6000
5	4.20 E-7	0.0058	8000
6	3.50 E-7	0.0066	10000
7	4.20 E-7	0.0074	12000
8	8.40 E-7	0.0086	14000
9	9.10 E-7	0.0104	16000
10	1.19 E-6	0.0125	18000
11	2.10 E-6	0.0158	20000
12	2.80 E-6	0.0207	22000
13	3.57 E-6	0.0270	24000
14	3.22 E-6	0.0338	26000
15	3.78 E-6	0.0408	28000
16	3.78 E-6	0.0484	30000
17	3.08 E-6	0.0553	32000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0031	1000
2	0.0044	3000
3	0.0048	5000
4	0.0054	7000
5	0.0062	9000
6	0.0069	11000
7	0.0078	13000
8	0.0095	15000
9	0.0113	17000
10	0.0137	19000
11	0.0179	21000
12	0.0235	23000
13	0.0306	25000
14	0.0371	27000
15	0.0446	29000
16	0.0522	31000
17	0.0583	33000

TABLE 82

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM

TEMPERATURE DESICCATED AIR

SPECIMEN 2-1-10, ZERO-TENSION

F=12Hz, K2=10, R=0.5, 1/U=0, S=2.0

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.1631	0.0022	47000	1000	2.24 E-6
1.1631	0.0020	51000	4000	0.00 E+0
1.1631	0.0020	55000	4000	0.00 E+0
1.1631	0.0020	59000	4000	0.00 E+0
1.1631	0.0020	63000	4000	0.00 E+0
1.1631	0.0020	67000	4000	0.00 E+0
1.1637	0.0026	71000	4000	1.40 E-7
1.1637	0.0020	75000	4000	0.00 E+0
1.1637	0.0020	79000	4000	0.00 E+0
1.1637	0.0020	83000	4000	0.00 E+0
1.1637	0.0020	87000	4000	0.00 E+0
1.1648	0.0011	91000	4000	2.80 E-7
1.1648	0.0020	95000	4000	2.00 E+0
1.1648	0.0020	99000	4000	0.00 E+0
1.1710	0.0062	103000	4000	1.54 E-6
1.1754	0.0045	107000	4000	1.12 E-6
1.1827	0.0073	111000	4000	1.82 E-6
1.1906	0.0078	115000	4000	1.96 E-6
1.1978	0.0073	119000	4000	1.82 E-6
1.2040	0.0062	123000	4000	1.54 E-6
RUN NO. 2				
1.2057	0.0017	124000	1000	1.68 E-6
1.2057	0.0020	128000	4000	0.00 E+0
1.2068	0.0011	132000	4000	2.80 E-7
1.2068	0.0020	136000	4000	0.00 E+0
1.2068	0.0020	140000	4000	0.00 E+0
1.2074	0.0026	144000	4000	1.40 E-7
1.2074	0.0020	148000	4000	0.00 E+0
1.2074	0.0020	152000	4000	0.00 E+0
1.2074	0.0020	156000	4000	0.00 E+0
1.2074	0.0020	160000	4000	0.00 E+0
1.2074	0.0020	164000	4000	0.00 E+0
1.2085	0.0011	168000	4000	2.80 E-7
1.2146	0.0062	172000	4000	1.54 E-6
1.2191	0.0045	176000	4000	1.12 E-6
1.2253	0.0062	180000	4000	1.54 E-6
1.2320	0.0067	184000	4000	1.68 E-6
1.2387	0.0067	188000	4000	1.68 E-6
1.2449	0.0062	192000	4000	1.54 E-6
1.2499	0.0050	196000	4000	1.26 E-6
1.2572	0.0073	200000	4000	1.82 E-6

TABLE 82 (continued)

## RUN NO. 3

1.2589	0.0017	201000	1000	1.68 E-6
1.2589	0.0000	205000	4000	0.00 E+0
1.2594	0.0006	209000	4000	1.40 E-7
1.2600	0.0006	213000	4000	1.40 E-7
1.2600	0.0000	217000	4000	0.00 E+0
1.2600	0.0000	221000	4000	0.00 E+0
1.2600	0.0000	225000	4000	0.00 E+0
1.2606	0.0006	229000	4000	1.40 E-7
1.2606	0.0000	233000	4000	0.00 E+0
1.2606	0.0000	237000	4000	0.00 E+0
1.2606	0.0000	241000	4000	0.00 E+0
1.2606	0.0000	245000	4000	0.00 E+0
1.2622	0.0017	249000	4000	4.20 E-7
1.2639	0.0017	253000	4000	4.20 E-7
1.2673	0.0034	257000	4000	8.40 E-7
1.2740	0.0067	261000	4000	1.68 E-6
1.2802	0.0062	265000	4000	1.54 E-6
1.2858	0.0056	269000	4000	1.40 E-6
1.2919	0.0062	273000	4000	1.54 E-6
1.2975	0.0056	277000	4000	1.40 E-6

## RUN NO. 4

1.3003	0.0028	278000	1000	2.80 E-6
1.3003	0.0000	282000	4000	0.00 E+0
1.3003	0.0000	286000	4000	0.00 E+0
1.3003	0.0000	290000	4000	0.00 E+0
1.3003	0.0000	294000	4000	0.00 E+0
1.3003	0.0000	298000	4000	0.00 E+0
1.3003	0.0000	302000	4000	0.00 E+0
1.3003	0.0000	306000	4000	0.00 E+0
1.3003	0.0000	310000	4000	0.00 E+0
1.3003	0.0000	314000	4000	0.00 E+0
1.3003	0.0000	318000	4000	0.00 E+0
1.3003	0.0000	322000	4000	0.00 E+0
1.3014	0.0011	326000	4000	2.80 E-7
1.3042	0.0028	330000	4000	7.00 E-7
1.3073	0.0028	334000	4000	7.00 E-7
1.3115	0.0045	338000	4000	1.12 E-6
1.3177	0.0062	342000	4000	1.54 E-6
1.3244	0.0067	346000	4000	1.68 E-6
1.3317	0.0073	350000	4000	1.82 E-6
1.3373	0.0056	354000	4000	1.40 E-6

TABLE 82 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	2.10 E-6	0.0011	500
2	0.00 E+0	0.0021	3000
3	1.05 E-7	0.0023	7000
4	3.50 E-8	0.0026	11000
5	0.00 E+0	0.0027	15000
6	3.50 E-8	0.0027	19000
7	3.50 E-8	0.0029	23000
8	3.50 E-8	0.0030	27000
9	0.00 E+0	0.0031	31000
10	0.00 E+0	0.0031	35000
11	0.00 E+0	0.0031	39000
12	1.40 E-7	0.0034	43000
13	5.60 E-7	0.0048	47000
14	5.60 E-7	0.0070	51000
15	1.15 E-6	0.0104	55000
16	1.40 E-6	0.0155	59000
17	1.65 E-6	0.0216	63000
18	1.65 E-6	0.0282	67000
19	1.61 E-6	0.0347	71000
20	1.54 E-6	0.0410	75000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0021	1000
2	0.0021	5000
3	0.0025	9000
4	0.0027	13000
5	0.0027	17000
6	0.0028	21000
7	0.0029	25000
8	0.0031	29000
9	0.0031	33000
10	0.0031	37000
11	0.0031	41000
12	0.0036	45000
13	0.0059	49000
14	0.0081	53000
15	0.0127	57000
16	0.0183	61000
17	0.0249	65000
18	0.0315	69000
19	0.0379	73000
20	0.0441	77000

TABLE 83

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 1-L-20, ZERO-TENSION  
 F=12Hz, K2=10, R=0.3, 1/U=0, S=2.5

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.5972	0.0020	10000	1000	1.96 E-6
0.5998	0.0025	30000	20000	1.26 E-7
0.6014	0.0017	50000	20000	8.40 E-8
0.6031	0.0017	70000	20000	8.40 E-8
0.6051	0.0020	80000	10000	1.96 E-7
0.6082	0.0031	85000	5000	6.16 E-7
0.6140	0.0059	90000	5000	1.18 E-6
0.6177	0.0036	92000	2000	1.82 E-6
0.6216	0.0039	94000	2000	1.96 E-6
0.6255	0.0039	96000	2000	1.96 E-6
0.6303	0.0048	98000	2000	2.38 E-6
0.6350	0.0048	100000	2000	2.38 E-6
0.6420	0.0070	102000	2000	3.50 E-6
0.6496	0.0076	104000	2000	3.78 E-6
0.6566	0.0070	106000	2000	3.50 E-6
0.6642	0.0076	108000	2000	3.78 E-6
RUN NO. 2				
0.8641	0.0022	215000	1000	2.24 E-6
0.8658	0.0017	235000	20000	8.40 E-8
0.8683	0.0025	255000	20000	1.26 E-7
0.8708	0.0025	275000	20000	1.26 E-7
0.8722	0.0014	285000	10000	1.40 E-7
0.8733	0.0011	290000	5000	2.24 E-7
0.8750	0.0017	295000	5000	3.36 E-7
0.8789	0.0039	297000	2000	1.96 E-6
0.8823	0.0034	299000	2000	1.68 E-6
0.8879	0.0056	301000	2000	2.80 E-6
0.8952	0.0073	303000	2000	3.64 E-6
0.9019	0.0067	305000	2000	3.36 E-6
0.9094	0.0076	307000	2000	3.78 E-6
0.9164	0.0070	309000	2000	3.50 E-6
0.9240	0.0076	311000	2000	3.78 E-6
0.9316	0.0076	313000	2000	3.78 E-6

TABLE 83 (continued)

RUN NO. 3

0.9688	0.0025	324000	1000	2.52 E-6
0.9730	0.0042	344000	20000	2.10 E-7
0.9741	0.0011	364000	20000	5.60 E-8
0.9755	0.0014	384000	20000	7.00 E-8
0.9783	0.0028	394000	10000	2.80 E-7
0.9806	0.0022	399000	5000	4.48 E-7
0.9856	0.0050	404000	5000	1.01 E-6
0.9892	0.0036	406000	2000	1.82 E-6
0.9951	0.0059	408000	2000	2.94 E-6
1.0035	0.0084	410000	2000	4.20 E-6
1.0102	0.0067	412000	2000	3.36 E-6
1.0167	0.0064	414000	2000	3.22 E-6
1.0242	0.0076	416000	2000	3.78 E-6
1.0304	0.0062	418000	2000	3.08 E-6
1.0388	0.0084	420000	2000	4.20 E-6
1.0452	0.0064	422000	2000	3.22 E-6

TABLE 83 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	2.24 E-6	0.0011	500
2	1.40 E-7	0.0036	11000
3	8.87 E-8	0.0059	31000
4	9.33 E-8	0.0077	51000
5	2.05 E-7	0.0097	66000
6	4.29 E-7	0.0118	73500
7	8.40 E-7	0.0150	78500
8	1.87 E-6	0.0189	82000
9	2.19 E-6	0.0230	84000
10	2.99 E-6	0.0282	86000
11	3.13 E-6	0.0343	88000
12	2.99 E-6	0.0404	90000
13	3.69 E-6	0.0471	92000
14	3.45 E-6	0.0542	94000
15	3.83 E-6	0.0615	96000
16	3.59 E-6	0.0689	98000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0022	1000
2	0.0050	21000
3	0.0068	41000
4	0.0087	61000
5	0.0107	71000
6	0.0129	76000
7	0.0171	81000
8	0.0208	83000
9	0.0252	85000
10	0.0312	87000
11	0.0374	89000
12	0.0434	91000
13	0.0508	93000
14	0.0577	95000
15	0.0653	97000
16	0.0725	99000



TABLE 84

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 2-L-8, ZERO-TENSION  
 F=12Hz, K2=10, R=0.5, 1/U=0, S=2.5

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.9248	0.0011	16250	1000	1.12 E-6
0.9248	0.0000	36250	20000	0.00 E+0
0.9248	0.0000	56250	20000	0.00 E+0
0.9254	0.0006	76250	20000	2.80 E-8
0.9257	0.0003	96250	20000	1.40 E-8
0.9271	0.0014	106250	10000	1.40 E-7
0.9285	0.0014	116250	10000	1.40 E-7
0.9304	0.0020	126250	10000	1.96 E-7
0.9318	0.0014	136250	10000	1.40 E-7
0.9349	0.0031	146250	10000	3.08 E-7
0.9374	0.0025	152250	6000	4.20 E-7
0.9397	0.0022	155250	3000	7.47 E-7
0.9419	0.0022	158250	3000	7.47 E-7
0.9450	0.0031	161250	3000	1.03 E-6
0.9492	0.0042	164250	3000	1.40 E-6
0.9534	0.0042	167250	3000	1.40 E-6
0.9573	0.0039	170250	3000	1.31 E-6
0.9610	0.0036	173250	3000	1.21 E-6
0.9654	0.0045	176250	3000	1.49 E-6
0.9699	0.0045	179250	3000	1.49 E-6
0.9744	0.0045	182250	3000	1.49 E-6
0.9789	0.0045	185250	3000	1.49 E-6
0.9825	0.0036	188250	3000	1.21 E-6
0.9870	0.0045	191250	3000	1.49 E-6
0.9915	0.0045	194250	3000	1.49 E-6

TABLE 84 (continued)

RUN NO. 2

1.2264	0.0008	528000	1000	8.40 E-7
1.2270	0.0009	608000	80000	1.05 E-8
1.2272	0.0000	638000	80000	0.00 E+0
1.2272	0.0000	738000	50000	0.00 E+0
1.2272	0.0000	768000	30000	0.00 E+0
1.2272	0.0000	788000	20000	0.00 E+0
1.2303	0.0031	806000	18000	1.66 E-7
1.2314	0.0012	815000	9000	1.24 E-7
1.2320	0.0006	821000	6000	9.33 E-8
1.2334	0.0014	827000	6000	2.33 E-7
1.2348	0.0014	833000	6000	2.34 E-7
1.2365	0.0017	839000	6000	2.80 E-7
1.2379	0.0014	842000	3000	4.67 E-7
1.2393	0.0014	845000	3000	4.67 E-7
1.2415	0.0022	848000	3000	7.47 E-7
1.2435	0.0020	851000	3000	6.53 E-7
1.2454	0.0020	854000	3000	6.53 E-7
1.2480	0.0025	857000	3000	8.40 E-7
1.2510	0.0031	860000	3000	1.03 E-6
1.2544	0.0034	863000	3000	1.12 E-6
1.2578	0.0034	866000	3000	1.12 E-6
1.2603	0.0025	869000	3000	8.40 E-7
1.2639	0.0036	872000	3000	1.21 E-6
1.2681	0.0042	875000	3000	1.40 E-6
1.2718	0.0036	878000	3000	1.21 E-6
1.2757	0.0039	881000	3000	1.31 E-6
1.2799	0.0042	884000	3000	1.40 E-6
1.2841	0.0042	887000	3000	1.40 E-6
1.2886	0.0045	890000	3000	1.49 E-6

TABLE 84 (continued)

RUN NO. 3

1.4619	0.00008	957000	1000	8.40 E-7
1.4633	0.00014	103700 0	80000	1.75 E-8
1.4644	0.00011	111700 0	80000	1.40 E-8
1.4644	0.00000	116700 0	50000	0.00 E+0
1.4652	0.00003	119700 0	30000	2.80 E-8
1.4652	0.00000	121700 0	20000	0.00 E+0
1.4655	0.00003	123500 0	18000	1.56 E-8
1.4655	0.00000	124400 0	9000	0.00 E+0
1.4655	0.00000	125000 0	6000	0.00 E+0
1.4655	0.00000	125600 0	6000	0.00 E+0
1.4655	0.00000	126200 0	6000	0.00 E+0
1.4655	0.00000	126800 0	6000	0.00 E+0
1.4655	0.00000	127100 0	3000	0.00 E+0
1.4655	0.00000	127400 0	3000	0.00 E+0
1.4655	0.00000	127700 0	3000	0.00 E+0
1.4658	0.00003	128000 0	3000	9.34 E-8
1.4658	0.00000	128300 0	3000	0.00 E+0
1.4661	0.00003	128600 0	3000	9.33 E-8
1.4661	0.00000	128900 0	3000	0.00 E+0
1.4661	0.00000	129200 0	3000	0.00 E+0
1.4661	0.00000	129500 0	3000	0.00 E+0
1.4661	0.00000	129800 0	3000	0.00 E+0
1.4661	0.00000	130100 0	3000	0.00 E+0
1.4661	0.00000	130400 0	3000	0.00 E+0
1.4661	0.00000	130700 0	3000	0.00 E+0
1.4661	0.00000	131000 0	3000	0.00 E+0
1.4661	0.00000	131300 0	3000	0.00 E+0
1.4661	0.00000	131600 0	3000	0.00 E+0
1.4661	0.00000	131900 0	3000	0.00 E+0

TABLE 84 (continued)

RUN NO. 3 CONTINUED

1.4661	0.0000	132200 0	3000	0.00
1.4661	0.0000	132500 2	3000	0.00
1.4661	0.0000	132800 0	3000	0.00
1.4661	0.0000	133100 0	3000	0.00
1.4661	0.0000	133400 0	3000	0.00
1.4661	0.0000	133700 0	3000	0.00
1.4661	0.0000	134000 0	3000	0.00
1.4661	0.0000	134300 0	3000	0.00
1.4661	0.0000	134600 0	3000	0.00
1.4661	0.0000	134900 0	3000	0.00
1.4661	0.0000	135200 0	3000	0.00
1.4661	0.0000	135500 0	3000	0.00
1.4661	0.0000	135800 0	3000	0.00
1.4661	0.0000	136800 0	10000	0.00
1.4661	0.0000	137800 0	10000	0.00
1.4661	0.0000	138800 0	10000	0.00
1.4661	0.0000	139800 0	10000	0.00
1.4661	0.0000	140800 0	10000	0.00
1.4661	0.0000	141800 0	10000	0.00
1.4661	0.0000	142800 0	10000	0.00
1.4661	0.0000	143800 0	10000	0.00
1.4661	0.0000	144800 0	10000	0.00
1.4661	0.0000	145800 0	10000	0.00
1.4661	0.0000	137800 0	10000	0.00

Average data not presented since first run produced approximately 160,000 delay cycles, the second run produced in excess of 300,000, and the third run produced shut-off. Consequently, S=2.5 was considered to be very near shut-off for this case.

TABLE 85

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 1-L-1, ZERO-TENSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.5$ ,  $1/U=0$ ,  $S=2.6$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.1833	0.00022	16000	1000	2.24 E-6
1.1836	0.0003	41000	25000	1.12 E-6
1.1836	0.0000	66000	25000	0.00 E+0
1.1836	0.0000	91000	25000	0.00 E+0
1.1836	0.0000	116000	25000	0.00 E+0
1.1836	0.0000	141000	25000	0.00 E+0
1.1836	0.0000	166000	25000	0.00 E+0
1.1836	0.0000	191000	25000	0.00 E+0
1.1836	0.0000	216000	25000	0.00 E+0
1.1836	0.0000	241000	25000	0.00 E+0
1.1836	0.0000	266000	25000	0.00 E+0
1.1836	0.0000	291000	25000	0.00 E+0
1.1836	0.0000	316000	25000	0.00 E+0
1.1838	0.0003	341000	25000	1.12 E-6
1.1838	0.0000	366000	25000	0.00 E+0
1.1838	0.0000	391000	25000	0.00 E+0
1.1838	0.0000	416000	25000	0.00 E+0
1.1838	0.0000	441000	25000	0.00 E+0
1.1838	0.0000	466000	25000	0.00 E+0
1.1838	0.0000	491000	25000	0.00 E+0
1.1838	0.0000	516000	25000	0.00 E+0
1.1838	0.0000	541000	25000	0.00 E+0
1.1838	0.0000	566000	25000	0.00 E+0
1.1838	0.0000	591000	25000	0.00 E+0
1.1838	0.0000	616000	25000	0.00 E+0
1.1838	0.0000	641000	25000	0.00 E+0
1.1838	0.0000	666000	25000	0.00 E+0
1.1838	0.0000	691000	25000	0.00 E+0
1.1838	0.0000	716000	25000	0.00 E+0

$S=2.6$  considered to be overload shut-off ratio for this case.

TABLE 86

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 1-L-20, ZERO-TENSION  
 F=12Hz, K2=10, R=0.3, 1/U=0, S=3.0

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.0881	0.0039	2000	1000	3.92 E-6
1.0900	0.0019	82000	80000	2.45 E-8
1.0900	0.0000	162000	80000	0.00 E+0
1.0931	0.0031	242000	80000	3.85 E-8
1.0962	0.0014	282000	40000	7.70 E-8
1.0962	0.0000	322000	40000	0.00 E+0
1.0970	0.0008	362000	40000	2.10 E-8
1.0970	0.0000	372000	10000	0.00 E+0
1.0970	0.0000	382000	10000	0.00 E+0
1.0970	0.0000	392000	10000	0.00 E+0
1.0976	0.0006	402000	10000	5.60 E-8
1.0982	0.0006	412000	10000	5.60 E-8
1.0990	0.0008	422000	10000	8.40 E-8
1.0990	0.0000	432000	10000	0.00 E+0
1.0990	0.0000	442000	10000	0.00 E+0
1.1001	0.0011	452000	10000	1.12 E-7
1.1010	0.0008	462000	10000	8.40 E-8
1.1032	0.0022	472000	10000	2.24 E-7
1.1043	0.0011	477000	5000	2.24 E-7
1.1066	0.0022	482000	5000	4.48 E-7
1.1108	0.0042	487000	5000	8.40 E-7
1.1217	0.0109	492000	5000	2.18 E-6
1.1250	0.0034	494000	2000	1.68 E-6
1.1340	0.0090	496000	2000	4.48 E-6
1.1424	0.0084	498000	2000	4.20 E-6
1.1500	0.0076	500000	2000	3.78 E-6
1.1567	0.0067	502000	2000	3.36 E-6
1.1648	0.0081	504000	2000	4.06 E-6
1.1710	0.0062	506000	2000	3.08 E-6

TABLE 86 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	3.92 E-6	0.0020	500
2	2.45 E-8	0.0049	41000
3	0.00 E+0	0.0058	121000
4	3.85 E-8	0.0074	201000
5	7.70 E-8	0.0096	261000
6	0.00 E+0	0.0103	301000
7	2.10 E-8	0.0107	341000
8	0.00 E+0	0.0111	366000
9	0.00 E+0	0.0111	376000
10	0.00 E+0	0.0111	386000
11	5.60 E-8	0.0114	396000
12	5.60 E-8	0.0120	406000
13	8.40 E-8	0.0127	416000
14	0.00 E+0	0.0131	426000
15	0.00 E+0	0.0131	436000
16	1.12 E-7	0.0136	446000
17	8.40 E-8	0.0146	456000
18	2.24 E-7	0.0162	466000
19	2.24 E-7	0.0178	473500
20	4.48 E-7	0.0195	478500
21	8.40 E-7	0.0227	483500
22	2.18 E-6	0.0303	488500
23	1.68 E-6	0.0374	492000
24	4.48 E-6	0.0436	494000
25	4.20 E-6	0.0523	496000
26	3.78 E-6	0.0603	498000
27	3.36 E-6	0.0674	500000
28	4.06 E-6	0.0748	502000
29	3.08 E-6	0.0820	504000

TABLE 86 (continued)

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0039	1000
2	0.0058	81000
3	0.0058	161000
4	0.0089	241000
5	0.0103	281000
6	0.0103	321000
7	0.0111	361000
8	0.0111	371000
9	0.0111	381000
10	0.0111	391000
11	0.0117	401000
12	0.0122	411000
13	0.0131	421000
14	0.0131	431000
15	0.0131	441000
16	0.0142	451000
17	0.0150	461000
18	0.0173	471000
19	0.0184	476000
20	0.0206	481000
21	0.0248	486000
22	0.0358	491000
23	0.0391	493000
24	0.0481	495000
25	0.0565	497000
26	0.0640	499000
27	0.0708	501000
28	0.0789	503000
29	0.0850	505000



TABLE 87

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
TEMPERATURE DESICCATED AIR

SPECIMEN NO. 3-L-7, ZERO-TENSION

$F = 12\text{Hz}$ ,  $K_2 = 10$ ,  $R = 0.3$ ,  $1/U = 0$ ,  $S = 3.1$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.0091	0.0036	7000	1000	3.64 E-6
1.0133	0.0042	32000	25000	1.68 E-7
1.0136	0.0003	57000	25000	1.12 E-8
1.0136	0.0000	82000	25000	0.00 E+0
1.0136	0.0000	107000	25000	0.00 E+0
1.0136	0.0000	132000	25000	0.00 E+0
1.0136	0.0000	157000	25000	0.00 E+0
1.0136	0.0000	182000	25000	0.00 E+0
1.0136	0.0000	207000	25000	0.00 E+0
1.0142	0.0006	232000	25000	2.24 E-8
1.0142	0.0000	257000	25000	0.00 E+0
1.0142	0.0000	282000	25000	0.00 E+0
1.0142	0.0000	307000	25000	0.00 E+0
1.0142	0.0000	332000	25000	0.00 E+0
1.0142	0.0000	357000	25000	0.00 E+0
1.0142	0.0000	382000	25000	0.00 E+0
1.0142	0.0000	407000	25000	0.00 E+0
1.0142	0.0000	432000	25000	0.00 E+0
1.0142	0.0000	457000	25000	0.00 E+0
1.0142	0.0000	482000	25000	0.00 E+0
1.0142	0.0000	507000	25000	0.00 E+0
1.0142	0.0000	532000	25000	0.00 E+0
1.0142	0.0000	557000	25000	0.00 E+0
1.0142	0.0000	582000	25000	0.00 E+0
1.0142	0.0000	607000	25000	0.00 E+0
1.0142	0.0000	632000	25000	0.00 E+0
1.0142	0.0000	657000	25000	0.00 E+0
1.0142	0.0000	682000	25000	0.00 E+0
1.0142	0.0000	707000	25000	0.00 E+0

Both crack tips shut-off.

Data Tabulations for Compression-Tension Load  
Class,  $K_2=10 \text{ KSI } \sqrt{\text{In.}}$

TABLE 88

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN 5-L-17, COMPRESSION-TENSION  
 $F=12\text{Hz}$ ,  $K2=10$ ,  $R=0.1$ ,  $U_c = -1$ ,  $S=1.5$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NØ. 1				
0.5981	0.0039	19000	1000	3.92 E-6
0.6014	0.0034	20000	1000	3.36 E-6
0.6059	0.0045	21000	1000	4.48 E-6
0.6096	0.0036	22000	1000	3.64 E-6
0.6152	0.0056	23000	1000	5.60 E-6
0.6194	0.0042	24000	1000	4.20 E-6
0.6247	0.0053	25000	1000	5.32 E-6
0.6292	0.0045	26000	1000	4.48 E-6
0.6348	0.0056	27000	1000	5.60 E-6
0.6404	0.0056	28000	1000	5.60 E-6
0.6460	0.0056	29000	1000	5.60 E-6
RUN NØ. 2				
0.6504	0.0045	30000	1000	4.48 E-6
0.6535	0.0031	31000	1000	3.08 E-6
0.6574	0.0039	32000	1000	3.92 E-6
0.6619	0.0045	33000	1000	4.48 E-6
0.6661	0.0042	34000	1000	4.20 E-6
0.6712	0.0050	35000	1000	5.04 E-6
0.6751	0.0039	36000	1000	3.92 E-6
0.6815	0.0064	37000	1000	6.44 E-6
0.6877	0.0062	38000	1000	6.16 E-6
0.6927	0.0050	39000	1000	5.04 E-6
0.6966	0.0039	40000	1000	3.92 E-6
RUN NØ. 3				
0.7003	0.0036	41000	1000	3.64 E-6
0.7039	0.0036	42000	1000	3.64 E-6
0.7073	0.0034	43000	1000	3.36 E-6
0.7120	0.0048	44000	1000	4.76 E-6
0.7168	0.0048	45000	1000	4.76 E-6
0.7230	0.0062	46000	1000	6.16 E-6
0.7280	0.0050	47000	1000	5.04 E-6
0.7336	0.0056	48000	1000	5.60 E-6
0.7386	0.0050	49000	1000	5.04 E-6
0.7434	0.0048	50000	1000	4.76 E-6
0.7476	0.0042	51000	1000	4.20 E-6

TABLE 88 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	4.01 E-6	0.0020	500
2	3.36 E-6	0.0057	1500
3	3.92 E-6	0.0093	2500
4	4.29 E-6	0.0134	3500
5	4.85 E-6	0.0180	4500
6	5.13 E-6	0.0230	5500
7	4.76 E-6	0.0280	6500
8	5.51 E-6	0.0331	7500
9	5.60 E-6	0.0386	8500
10	5.13 E-6	0.0440	9500
11	4.57 E-6	0.0489	10500

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0040	1000
2	0.0074	2000
3	0.0113	3000
4	0.0156	4000
5	0.0204	5000
6	0.0256	6000
7	0.0303	7000
8	0.0353	8000
9	0.0414	9000
10	0.0466	10000
11	0.0511	11000

TABLE 89

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 5-I-10, COMPRESSION-TENSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.3$ ,  $U_c=-1$ ,  $S=1.5$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.4948	0.0025	1000	1000	2.52 E-6
0.4962	0.0014	2000	1000	1.40 E-6
0.4970	0.0008	3000	1000	8.40 E-7
0.4998	0.0028	4000	1000	2.80 E-6
0.5020	0.0022	5000	1000	2.24 E-6
0.5048	0.0028	6000	1000	2.80 E-6
0.5076	0.0028	7000	1000	2.80 E-6
0.5116	0.0039	8000	1000	3.92 E-6
0.5149	0.0034	9000	1000	3.36 E-6
0.5180	0.0031	10000	1000	3.08 E-6
0.5219	0.0039	11000	1000	3.92 E-6
0.5256	0.0036	12000	1000	3.64 E-6
0.5278	0.0022	13000	1000	2.24 E-6
RUN NO. 2				
0.5317	0.0039	14000	1000	3.92 E-6
0.5337	0.0020	15000	1000	1.96 E-6
0.5356	0.0020	16000	1000	1.96 E-6
0.5382	0.0025	17000	1000	2.52 E-6
0.5404	0.0022	18000	1000	2.24 E-6
0.5440	0.0036	19000	1000	3.64 E-6
0.5477	0.0036	20000	1000	3.64 E-6
0.5510	0.0034	21000	1000	3.36 E-6
0.5550	0.0039	22000	1000	3.92 E-6
0.5592	0.0042	23000	1000	4.20 E-6
0.5617	0.0025	24000	1000	2.52 E-6
0.5653	0.0036	25000	1000	3.64 E-6
0.5690	0.0036	26000	1000	3.64 E-6
RUN NO. 3				
0.5706	0.0017	27000	1000	1.68 E-6
0.5729	0.0022	28000	1000	2.24 E-6
0.5743	0.0014	29000	1000	1.40 E-6
0.5762	0.0020	30000	1000	1.96 E-6
0.5793	0.0031	31000	1000	3.08 E-6
0.5821	0.0028	32000	1000	2.80 E-6
0.5852	0.0031	33000	1000	3.08 E-6
0.5883	0.0031	34000	1000	3.08 E-6
0.5911	0.0028	35000	1000	2.80 E-6
0.5947	0.0036	36000	1000	3.64 E-6
0.5984	0.0036	37000	1000	3.64 E-6
0.6026	0.0042	38000	1000	4.20 E-6
0.6065	0.0039	39000	1000	3.92 E-6

(216)

TABLE 89 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	2.71 E-6	0.0014	500
2	1.87 E-6	0.0036	1500
3	1.40 E-6	0.0053	2500
4	2.43 E-6	0.0072	3500
5	2.52 E-6	0.0097	4500
6	3.08 E-6	0.0125	5500
7	3.17 E-6	0.0156	6500
8	3.45 E-6	0.0189	7500
9	3.36 E-6	0.0223	8500
10	3.64 E-6	0.0258	9500
11	3.36 E-6	0.0293	10500
12	3.83 E-6	0.0329	11500
13	3.27 E-6	0.0364	12500

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0027	1000
2	0.0046	2000
3	0.0060	3000
4	0.0084	4000
5	0.0109	5000
6	0.0140	6000
7	0.0172	7000
8	0.0206	8000
9	0.0240	9000
10	0.0276	10000
11	0.0310	11000
12	0.0348	12000
13	0.0381	13000

TABLE 90

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 5-L-17, COMPRESSION-TENSION  
 $F=12\text{Hz}$ ,  $K2=10$ ,  $R=0.5$ ,  $U_c = -1$ ,  $S=1.5$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.7764	0.0014	8000	1000	1.40 E-6
0.7773	0.0008	10000	2000	4.20 E-7
0.7778	0.0006	12000	2000	2.80 E-7
0.7792	0.0014	14000	2000	7.00 E-7
0.7804	0.0011	16000	2000	5.60 E-7
0.7832	0.0028	18000	2000	1.40 E-6
0.7854	0.0022	20000	2000	1.12 E-6
0.7885	0.0031	22000	2000	1.54 E-6
0.7910	0.0025	24000	2000	1.26 E-6
0.7941	0.0031	26000	2000	1.54 E-6
RUN NO. 2				
0.7949	0.0008	27000	1000	8.40 E-7
0.7952	0.0003	29000	2000	1.40 E-7
0.7966	0.0014	31000	2000	7.00 E-7
0.7988	0.0022	33000	2000	1.12 E-6
0.8005	0.0017	35000	2000	8.40 E-7
0.8033	0.0028	37000	2000	1.40 E-6
0.8061	0.0028	39000	2000	1.40 E-6
0.8089	0.0028	41000	2000	1.40 E-6
0.8120	0.0031	43000	2000	1.54 E-6
0.8145	0.0025	45000	2000	1.26 E-6
RUN NO. 3				
0.8154	0.0008	46000	1000	8.40 E-7
0.8165	0.0011	48000	2000	5.60 E-7
0.8170	0.0006	50000	2000	2.80 E-7
0.8182	0.0011	52000	2000	5.60 E-7
0.8204	0.0022	54000	2000	1.12 E-6
0.8229	0.0025	56000	2000	1.26 E-6
0.8257	0.0028	58000	2000	1.40 E-6
0.8282	0.0025	60000	2000	1.26 E-6
0.8305	0.0022	62000	2000	1.12 E-6
0.8333	0.0028	64000	2000	1.40 E-6

TABLE 90 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	1.03 E-6	0.0005	500
2	3.73 E-7	0.0014	2000
3	4.20 E-7	0.0022	4000
4	7.93 E-7	0.0034	6000
5	8.40 E-7	0.0050	8000
6	1.35 E-6	0.0072	10000
7	1.31 E-6	0.0099	12000
8	1.40 E-6	0.0126	14000
9	1.31 E-6	0.0153	16000
10	1.40 E-6	0.0180	18000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0010	1000
2	0.0018	3000
3	0.0026	5000
4	0.0042	7000
5	0.0059	9000
6	0.0086	11000
7	0.0112	13000
8	0.0140	15000
9	0.0166	17000
10	0.0194	19000



TABLE 91

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 5-L-14, COMPRESSION-TENSION  
 $F=12\text{Hz}$ ,  $K2=10$ ,  $R=0.1$ ,  $U_c = -1$ ,  $S=2.0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.0584	0.0036	22000	1000	3.64 E-6
1.0634	0.0050	26000	4000	1.26 E-6
1.0710	0.0076	30000	4000	1.89 E-6
1.0791	0.0081	32000	2000	4.06 E-6
1.0872	0.0081	34000	2000	4.06 E-6
1.0970	0.0098	36000	2000	4.90 E-6
1.1094	0.0123	38000	2000	6.16 E-6
1.1220	0.0126	40000	2000	6.30 E-6
1.1329	0.0109	42000	2000	5.46 E-6
1.1430	0.0101	44000	2000	5.04 E-6
1.1539	0.0109	46000	2000	5.46 E-6
1.1637	0.0098	48000	2000	4.90 E-6
1.1754	0.0118	50000	2000	5.88 E-6
RUN NO. 2				
1.1813	0.0059	51000	1000	5.88 E-6
1.1864	0.0050	55000	4000	1.26 E-6
1.1948	0.0084	59000	4000	2.10 E-6
1.2040	0.0092	61000	2000	4.62 E-6
1.2144	0.0104	63000	2000	5.18 E-6
1.2261	0.0118	65000	2000	5.88 E-6
1.2368	0.0106	67000	2000	5.32 E-6
1.2485	0.0118	69000	2000	5.88 E-6
1.2606	0.0120	71000	2000	6.02 E-6
1.2723	0.0118	73000	2000	5.88 E-6
1.2838	0.0115	75000	2000	5.74 E-6
1.2947	0.0109	77000	2000	5.46 E-6
1.3059	0.0112	79000	2000	5.60 E-6
RUN NO. 3				
1.3115	0.0056	80000	1000	5.60 E-6
1.3160	0.0045	84000	4000	1.12 E-6
1.3266	0.0106	88000	4000	2.66 E-6
1.3350	0.0084	90000	2000	4.20 E-6
1.3451	0.0101	92000	2000	5.04 E-6
1.3574	0.0123	94000	2000	6.16 E-6
1.3684	0.0109	96000	2000	5.46 E-6
1.3810	0.0126	98000	2000	6.30 E-6
1.3938	0.0129	100000	2000	6.44 E-6
1.4045	0.0106	102000	2000	5.32 E-6
1.4137	0.0092	104000	2000	4.62 E-6
1.4266	0.0129	106000	2000	6.44 E-6
1.4358	0.0092	108000	2000	4.62 E-6

(220)

TABLE 91 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	5.04 E-6	0.0025	500
2	1.21 E-6	0.0075	3000
3	2.22 E-6	0.0143	7000
4	4.29 E-6	0.0231	10000
5	4.76 E-6	0.0321	12000
6	5.65 E-6	0.0425	14000
7	5.65 E-6	0.0538	16000
8	6.16 E-6	0.0656	18000
9	5.97 E-6	0.0777	20000
10	5.41 E-6	0.0891	22000
11	5.27 E-6	0.0998	24000
12	5.60 E-6	0.1107	26000
13	5.37 E-6	0.1217	28000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0050	1000
2	0.0099	5000
3	0.0188	9000
4	0.0273	11000
5	0.0369	13000
6	0.0482	15000
7	0.0595	17000
8	0.0718	19000
9	0.0837	21000
10	0.0945	23000
11	0.1051	25000
12	0.1163	27000
13	0.1270	29000

TABLE 92

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 5-I-10, COMPRESSION-TENSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.3$ ,  $U_c=-1$ ,  $S=2.0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.6216	0.0014	5000	1000	1.40 E-6
0.6227	0.0011	9000	4000	2.80 E-7
0.6238	0.0011	13000	4000	2.80 E-7
0.6258	0.0020	17000	4000	4.90 E-7
0.6306	0.0048	21000	4000	1.19 E-6
0.6334	0.0028	23000	2000	1.40 E-6
0.6381	0.0048	25000	2000	2.38 E-6
0.6446	0.0064	27000	2000	3.22 E-6
0.6507	0.0062	29000	2000	3.08 E-6
0.6558	0.0050	31000	2000	2.52 E-6
0.6636	0.0078	33000	2000	3.92 E-6
0.6698	0.0062	35000	2000	3.08 E-6
0.6770	0.0073	37000	2000	3.64 E-6
0.6832	0.0062	39000	2000	3.08 E-6
0.6905	0.0073	41000	2000	3.64 E-6
RUN NO. 2				
0.7543	0.0022	60000	1000	2.24 E-6
0.7571	0.0028	64000	4000	7.00 E-7
0.7588	0.0017	68000	4000	4.20 E-7
0.7605	0.0017	72000	4000	4.20 E-7
0.7638	0.0034	76000	4000	8.40 E-7
0.7678	0.0039	78000	2000	1.96 E-6
0.7739	0.0062	80000	2000	3.08 E-6
0.7801	0.0062	82000	2000	3.08 E-6
0.7879	0.0078	84000	2000	3.92 E-6
0.7946	0.0067	86000	2000	3.36 E-6
0.8016	0.0070	88000	2000	3.50 E-6
0.8078	0.0062	90000	2000	3.08 E-6
0.8142	0.0064	92000	2000	3.22 E-6
0.8215	0.0073	94000	2000	3.64 E-6
0.8277	0.0062	96000	2000	3.08 E-6

TABLE 92 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	1.82 E-6	0.0009	500
2	4.90 E-7	0.0028	3000
3	3.50 E-7	0.0045	7000
4	4.55 E-7	0.0061	11000
5	1.01 E-6	0.0090	15000
6	1.68 E-6	0.0127	18000
7	2.73 E-6	0.0172	20000
8	3.15 E-6	0.0230	22000
9	3.50 E-6	0.0297	24000
10	2.94 E-6	0.0361	26000
11	3.71 E-6	0.0428	28000
12	3.08 E-6	0.0496	30000
13	3.43 E-6	0.0561	32000
14	3.36 E-6	0.0629	34000
15	3.36 E-6	0.0696	36000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0018	1000
2	0.0038	5000
3	0.0052	9000
4	0.0070	13000
5	0.0111	17000
6	0.0144	19000
7	0.0199	21000
8	0.0262	23000
9	0.0332	25000
10	0.0391	27000
11	0.0465	29000
12	0.0526	31000
13	0.0595	33000
14	0.0662	35000
15	0.0729	37000

TABLE 93

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 5-L-17, COMPRESSION-TENSION  
 $F=12\text{Hz}$ ,  $K2=10$ ,  $R=0.5$ ,  $U_c = -1$ ,  $S=2.0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.8604	0.0014	22000	1000	1.40 E-6
0.8618	0.0015	38000	16000	8.75 E-8
0.8618	0.0000	46000	8000	0.00 E+0
0.8618	0.0000	54000	8000	0.00 E+0
0.8627	0.0009	58000	4000	2.10 E-7
0.8635	0.0008	62000	4000	2.10 E-7
0.8644	0.0008	64000	2000	4.20 E-7
0.8646	0.0003	66000	2000	1.40 E-7
0.8649	0.0003	68000	2000	1.40 E-7
0.8655	0.0006	70000	2000	2.80 E-7
0.8663	0.0008	72000	2000	4.20 E-7
0.8677	0.0014	74000	2000	7.00 E-7
0.8694	0.0017	76000	2000	8.40 E-7
0.8714	0.0020	78000	2000	9.80 E-7
0.8736	0.0022	80000	2000	1.12 E-6
0.8761	0.0025	82000	2000	1.26 E-6
0.8798	0.0036	84000	2000	1.82 E-6
0.8831	0.0034	86000	2000	1.68 E-6
0.8859	0.0028	88000	2000	1.40 E-6
0.8890	0.0031	90000	2000	1.54 E-6
RUN NO. 2				
0.9150	0.0006	109000	1000	5.60 E-7
0.9153	0.0003	125000	16000	1.75 E-8
0.9159	0.0006	133000	8000	7.00 E-8
0.9164	0.0006	141000	8000	7.00 E-8
0.9167	0.0003	145000	4000	7.00 E-8
0.9170	0.0003	149000	4000	7.00 E-8
0.9176	0.0006	151000	2000	2.80 E-7
0.9190	0.0014	153000	2000	7.00 E-7
0.9204	0.0014	155000	2000	7.00 E-7
0.9223	0.0020	157000	2000	9.80 E-7
0.9251	0.0028	159000	2000	1.40 E-6
0.9279	0.0028	161000	2000	1.40 E-6
0.9293	0.0014	163000	2000	7.00 E-7
0.9330	0.0036	165000	2000	1.82 E-6
0.9360	0.0031	167000	2000	1.54 E-6
0.9391	0.0031	169000	2000	1.54 E-6
0.9422	0.0031	171000	2000	1.54 E-6
0.9450	0.0028	173000	2000	1.40 E-6
0.9478	0.0028	175000	2000	1.40 E-6
0.9506	0.0028	177000	2000	1.40 E-6

TABLE 93 (continued)

RUN NØ. 3

0.9624	0.0008	186000	1000	8.40 E-7
0.9635	0.0011	202000	16000	7.00 E-8
0.9638	0.0003	210000	8000	3.50 E-8
0.9646	0.0008	218000	8000	1.05 E-7
0.9649	0.0003	222000	4000	7.00 E-8
0.9649	0.0000	226000	4000	0.00 E+0
0.9652	0.0003	228000	2000	1.40 E-7
0.9654	0.0003	230000	2000	1.40 E-7
0.9660	0.0006	232000	2000	2.80 E-7
0.9682	0.0022	234000	2000	1.12 E-6
0.9696	0.0014	236000	2000	7.00 E-7
0.9710	0.0014	238000	2000	7.00 E-7
0.9741	0.0031	240000	2000	1.54 E-6
0.9789	0.0048	242000	2000	2.38 E-6
0.9825	0.0036	244000	2000	1.82 E-6
0.9856	0.0031	246000	2000	1.54 E-6
0.9884	0.0028	248000	2000	1.40 E-6
0.9909	0.0025	250000	2000	1.26 E-6
0.9929	0.0020	252000	2000	9.80 E-7
0.9954	0.0025	254000	2000	1.26 E-6

TABLE 93 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	9.33 E-7	0.0005	500
2	5.83 E-8	0.0014	9000
3	3.50 E-8	0.0020	21000
4	5.83 E-8	0.0024	29000
5	1.17 E-7	0.0029	35000
6	9.33 E-8	0.0033	39000
7	2.80 E-7	0.0038	42000
8	3.27 E-7	0.0044	44000
9	3.73 E-7	0.0051	46000
10	7.93 E-7	0.0062	48000
11	8.40 E-7	0.0079	50000
12	9.33 E-7	0.0097	52000
13	1.03 E-6	0.0116	54000
14	1.73 E-6	0.0144	56000
15	1.49 E-6	0.0176	58000
16	1.45 E-6	0.0205	60000
17	1.59 E-6	0.0236	62000
18	1.45 E-6	0.0266	64000
19	1.26 E-6	0.0293	66000
20	1.40 E-6	0.0320	68000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0009	1000
2	0.0019	17000
3	0.0022	25000
4	0.0026	33000
5	0.0031	37000
6	0.0035	41000
7	0.0041	43000
8	0.0047	45000
9	0.0055	47000
10	0.0070	49000
11	0.0087	51000
12	0.0106	53000
13	0.0126	55000
14	0.0161	57000
15	0.0191	59000
16	0.0220	61000
17	0.0251	63000
18	0.0280	65000
19	0.0306	67000
20	0.0334	69000

TABLE 94  
EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
TEMPERATURE DESICCATED AIR  
SPECIMEN NO. 3-L-18, COMPRESSION-TENSION  
F=12Hz, K2=10, R=0.1,  $U_g$  -1.0, S=2.5

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.7400	0.0053	7000	1000	5.32 E-6
0.7445	0.0045	15000	8000	5.60 E-7
0.7468	0.0022	23000	8000	2.80 E-7
0.7482	0.0014	31000	8000	1.75 E-7
0.7515	0.0034	39000	8000	4.20 E-7
0.7560	0.0045	43000	4000	1.12 E-6
0.7588	0.0028	45000	2000	1.40 E-6
0.7624	0.0036	47000	2000	1.82 E-6
0.7678	0.0053	49000	2000	2.66 E-6
0.7739	0.0062	51000	2000	3.08 E-6
0.7815	0.0076	53000	2000	3.78 E-6
0.7907	0.0092	55000	2000	4.62 E-6
0.8000	0.0092	57000	2000	4.62 E-6
0.8095	0.0095	59000	2000	4.76 E-6
0.8196	0.0101	61000	2000	5.04 E-6
0.8285	0.0090	63000	2000	4.48 E-6
0.8386	0.0101	65000	2000	5.04 E-6
0.8490	0.0104	67000	2000	5.18 E-6
0.8576	0.0087	69000	2000	4.34 E-6
RUN NO. 2				
0.8618	0.0042	70000	1000	4.20 E-6
0.8666	0.0048	78000	8000	5.95 E-7
0.8691	0.0025	86000	8000	3.15 E-7
0.8722	0.0031	94000	8000	3.85 E-7
0.8786	0.0064	102000	8000	8.05 E-7
0.8884	0.0098	106000	4000	2.45 E-6
0.8952	0.0067	108000	2000	3.36 E-6
0.9022	0.0070	110000	2000	3.50 E-6
0.9100	0.0078	112000	2000	3.92 E-6
0.9178	0.0078	114000	2000	3.92 E-6
0.9288	0.0109	116000	2000	5.46 E-6
0.9380	0.0092	118000	2000	4.62 E-6
0.9470	0.0090	120000	2000	4.48 E-6
0.9556	0.0087	122000	2000	4.34 E-6
0.9643	0.0087	124000	2000	4.34 E-6
0.9755	0.0112	126000	2000	5.60 E-6
0.9867	0.0112	128000	2000	5.60 E-6
0.9965	0.0098	130000	2000	4.90 E-6
1.0077	0.0112	132000	2000	5.60 E-6



TABLE 94 (continued)

RUN NO. 3

1.0119	0.0042	133000	1000	4.20 E-6
1.0170	0.0050	141000	8000	6.30 E-7
1.0198	0.0028	149000	8000	3.50 E-7
1.0220	0.0022	157000	8000	2.80 E-7
1.0290	0.0070	165000	8000	8.75 E-7
1.0396	0.0106	169000	4000	2.66 E-6
1.0461	0.0064	171000	2000	3.22 E-6
1.0520	0.0059	173000	2000	2.94 E-6
1.0626	0.0106	175000	2000	5.32 E-6
1.0727	0.0101	177000	2000	5.04 E-6
1.0814	0.0087	179000	2000	4.34 E-6
1.0914	0.0101	181000	2000	5.04 E-6
1.1021	0.0106	183000	2000	5.32 E-6
1.1116	0.0095	185000	2000	4.76 E-6
1.1211	0.0095	187000	2000	4.76 E-6
1.1304	0.0092	189000	2000	4.62 E-6
1.1396	0.0092	191000	2000	4.62 E-6
1.1491	0.0095	193000	2000	4.76 E-6
1.1572	0.0081	195000	2000	4.06 E-6

TABLE 94 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	4.57 E-6	0.0023	500
2	5.95 E-7	0.0070	5000
3	3.15 E-7	0.0106	13000
4	2.80 E-7	0.0130	21000
5	7.00 E-7	0.0169	29000
6	2.08 E-6	0.0238	35000
7	2.66 E-6	0.0307	38000
8	2.75 E-6	0.0361	40000
9	3.97 E-6	0.0428	42000
10	4.01 E-6	0.0508	44000
11	4.53 E-6	0.0593	46000
12	4.76 E-6	0.0686	48000
13	4.81 E-6	0.0782	50000
14	4.62 E-6	0.0876	52000
15	4.71 E-6	0.0969	54000
16	4.90 E-6	0.1065	56000
17	5.09 E-6	0.1165	58000
18	4.95 E-6	0.1266	60000
19	4.67 E-6	0.1362	62000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0046	1000
2	0.0093	9000
3	0.0119	17000
4	0.0141	25000
5	0.0197	33000
6	0.0280	37000
7	0.0333	39000
8	0.0388	41000
9	0.0468	43000
10	0.0548	45000
11	0.0638	47000
12	0.0734	49000
13	0.0830	51000
14	0.0922	53000
15	0.1016	55000
16	0.1114	57000
17	0.1216	59000
18	0.1315	61000
19	0.1408	63000

TABLE 95

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 5-L-10, COMPRESSION-TENSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.3$ ,  $U_c = -1$ ,  $S=2.5$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.8579	0.0022	9000	1000	2.24 E-6
0.8599	0.0020	17000	8000	2.45 E-7
0.8610	0.0011	25000	8000	1.40 E-7
0.8624	0.0014	33000	8000	1.75 E-7
0.8627	0.0003	41000	8000	3.50 E-8
0.8632	0.0006	49000	8000	7.00 E-8
0.8649	0.0017	57000	8000	2.10 E-7
0.8658	0.0008	65000	8000	1.05 E-7
0.8660	0.0003	73000	8000	3.50 E-8
0.8672	0.0011	81000	8000	1.40 E-7
0.8677	0.0006	89000	8000	7.00 E-8
0.8705	0.0028	97000	8000	3.50 E-7
0.8806	0.0101	101000	4000	2.52 E-6
0.8865	0.0059	103000	2000	2.94 E-6
0.8949	0.0084	105000	2000	4.20 E-6
0.9005	0.0056	107000	2000	2.80 E-6
0.9078	0.0073	109000	2000	3.64 E-6
0.9142	0.0064	111000	2000	3.22 E-6
0.9187	0.0045	113000	2000	2.24 E-6
0.9262	0.0076	115000	2000	3.78 E-6

TABLE 95 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	2.24 E-6	0.0011	500
2	2.45 E-7	0.0032	5000
3	1.40 E-7	0.0048	13000
4	1.75 E-7	0.0060	21000
5	3.50 E-8	0.0069	29000
6	7.00 E-8	0.0073	37000
7	2.10 E-7	0.0084	45000
8	1.05 E-7	0.0097	53000
9	3.50 E-8	0.0102	61000
10	1.40 E-7	0.0109	69000
11	7.00 E-8	0.0118	77000
12	3.50 E-7	0.0134	85000
13	2.52 E-6	0.0199	91000
14	2.94 E-6	0.0279	94000
15	4.20 E-6	0.0350	96000
16	2.80 E-6	0.0420	98000
17	3.64 E-6	0.0484	100000
18	3.22 E-6	0.0553	102000
19	2.24 E-6	0.0608	104000
20	3.78 E-6	0.0668	106000

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0022	1000
2	0.0042	9000
3	0.0053	17000
4	0.0067	25000
5	0.0070	33000
6	0.0076	41000
7	0.0092	49000
8	0.0101	57000
9	0.0104	65000
10	0.0115	73000
11	0.0120	81000
12	0.0148	89000
13	0.0249	93000
14	0.0308	95000
15	0.0392	97000
16	0.0448	99000
17	0.0521	101000
18	0.0585	103000
19	0.0630	105000
20	0.0706	107000

TABLE 96

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 5-L-2, COMPRESSION-TENSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.3$ ,  $U_c = -1$ ,  $S=2.7$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.4648	0.0039	2000	1000	3.92 E-6
0.4654	0.0006	27000	25000	2.24 E-8
0.4665	0.0011	52000	25000	4.48 E-8
0.4665	0.0000	77000	25000	0.00 E+0
0.4668	0.0003	102000	25000	1.12 E-8
0.4670	0.0003	127000	25000	1.12 E-8
0.4670	0.0000	152000	25000	0.00 E+0
0.4670	0.0000	177000	25000	0.00 E+0
0.4670	0.0000	202000	25000	0.00 E+0
0.4670	0.0000	227000	25000	0.00 E+0
0.4704	0.0034	252000	25000	1.34 E-7
0.5236	0.0532	277000	25000	2.13 E-6

Test performed to zero-in on overload shut-off ratio. Test terminated prior to reaching  $(da/dN)_0$ .

TABLE 97  
EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
TEMPERATURE DESICCATED AIR  
SPECIMEN NO. 5-L-2, COMPRESSION-TENSION  
F=12Hz,  $K_2=10$ , R=0.3,  $U_c = -1$ , S=2.8

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.7269	0.0036	54500	1000	3.64 E-6
0.7297	0.0028	79500	25000	1.12 E-7
0.7297	0.0000	104500	25000	0.00 E+0
0.7297	0.0000	129500	25000	0.00 E+0
0.7297	0.0000	154500	25000	0.00 E+0
0.7302	0.0006	179500	25000	2.24 E-8
0.7302	0.0000	204500	25000	0.00 E+0
0.7302	0.0000	229500	25000	0.00 E+0
0.7302	0.0000	254500	25000	0.00 E+0
0.7302	0.0000	279500	25000	0.00 E+0
0.7302	0.0000	304500	25000	0.00 E+0
0.7302	0.0000	329500	25000	0.00 E+0
0.7302	0.0000	354500	25000	0.00 E+0
0.7302	0.0000	379500	25000	0.00 E+0
0.7302	0.0000	404500	25000	0.00 E+0
0.7302	0.0000	429500	25000	0.00 E+0
0.7302	0.0000	454500	25000	0.00 E+0
0.7302	0.0000	479500	25000	0.00 E+0
0.7302	0.0000	504500	25000	0.00 E+0
0.7302	0.0000	529500	25000	0.00 E+0
0.7308	0.0006	554500	25000	2.24 E-8
0.7314	0.0006	579500	25000	2.24 E-8
0.7314	0.0000	604500	25000	0.00 E+0
0.7314	0.0000	629500	25000	0.00 E+0
0.7314	0.0000	654500	25000	0.00 E+0
0.7314	0.0000	679500	25000	0.00 E+0
0.7314	0.0000	704500	25000	0.00 E+0
0.7314	0.0000	729500	25000	0.00 E+0
0.7314	0.0000	754500	25000	0.00 E+0

S=2.8 considered to be overload shut-off ratio for this case.

TABLE 98

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 5-L-12, COMPRESSION-TENSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.5$ ,  $U_c=-1$ ,  $S=2.5$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.7689	0.0008	7000	1000	8.40 E-7
0.7697	0.0008	32000	25000	3.36 E-8
0.7700	0.0003	57000	25000	1.12 E-8
0.7703	0.0003	82000	25000	1.12 E-8
0.7703	0.0000	107000	25000	0.00 E+0
0.7703	0.0000	132000	25000	0.00 E+0
0.7706	0.0003	157000	25000	1.12 E-8
0.7708	0.0003	182000	25000	1.12 E-8
0.7708	0.0000	207000	25000	0.00 E+0
0.7720	0.0011	232000	25000	4.48 E-8
0.7720	0.0000	257000	25000	0.00 E+0
0.7720	0.0000	282000	25000	0.00 E+0
0.7720	0.0000	307000	25000	0.00 E+0
0.7720	0.0000	332000	25000	0.00 E+0
0.7720	0.0000	357000	25000	0.00 E+0
0.7720	0.0000	382000	25000	0.00 E+0
0.7720	0.0000	407000	25000	0.00 E+0
0.7720	0.0000	432000	25000	0.00 E+0
0.7720	0.0000	457000	25000	0.00 E+0
0.7720	0.0000	482000	25000	0.00 E+0
0.7720	0.0000	507000	25000	0.00 E+0
0.7720	0.0000	532000	25000	0.00 E+0
0.7720	0.0000	557000	25000	0.00 E+0
0.7720	0.0000	582000	25000	0.00 E+0
0.7720	0.0000	607000	25000	0.00 E+0
0.7720	0.0000	632000	25000	0.00 E+0
0.7720	0.0000	657000	25000	0.00 E+0
0.7720	0.0000	682000	25000	0.00 E+0
0.7720	0.0000	707000	25000	0.00 E+0

Both crack tips shut-off.

TABLE 99  
EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
TEMPERATURE DESICCATED AIR  
SPECIMEN NO. 3-L-16, COMPRESSION-TENSION  
F=12Hz,  $K_2=10$ , R=0.1,  $U_0=-1$ , S=3.0

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.2620	0.0050	4000	1000	5.04 E-6
1.2662	0.0043	28000	24000	1.75 E-7
1.2681	0.0019	52000	24000	8.17 E-8
1.2690	0.0009	76000	24000	3.50 E-8
1.2695	0.0006	100000	24000	2.33 E-8
1.2695	0.0000	124000	24000	0.00 E+0
1.2709	0.0014	148000	24000	5.83 E-8
1.2709	0.0000	172000	24000	0.00 E+0
1.2712	0.0003	196000	24000	1.17 E-8
1.2723	0.0011	220000	24000	4.67 E-8
1.2751	0.0028	244000	24000	1.17 E-7
1.2807	0.0056	268000	24000	2.33 E-7
1.3135	0.0328	283000	15000	2.18 E-6
1.3213	0.0078	285000	2000	3.92 E-6
1.3272	0.0059	287000	2000	2.94 E-6
1.3356	0.0084	289000	2000	4.20 E-6
1.3420	0.0064	291000	2000	3.22 E-6
1.3493	0.0073	293000	2000	3.64 E-6
1.3586	0.0092	295000	2000	4.62 E-6
1.3672	0.0087	297000	2000	4.34 E-6
1.3759	0.0087	299000	2000	4.34 E-6
1.3840	0.0081	301000	2000	4.06 E-6



TABLE 99 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	5.04 E-6	0.0025	500
2	1.75 E-7	0.0072	13000
3	8.17 E-8	0.0103	37000
4	3.50 E-8	0.0117	61000
5	2.33 E-8	0.0124	85000
6	0.00 E+0	0.0127	109000
7	5.83 E-8	0.0134	133000
8	0.00 E+0	0.0141	157000
9	1.17 E-8	0.0143	181000
10	4.67 E-8	0.0150	205000
11	1.17 E-7	0.0169	229000
12	2.33 E-7	0.0211	253000
13	2.18 E-6	0.0403	272500
14	3.92 E-6	0.0606	281000
15	2.94 E-6	0.0675	283000
16	4.20 E-6	0.0746	285000
17	3.22 E-6	0.0820	287000
18	3.64 E-6	0.0889	289000
19	4.62 E-6	0.0972	291000
20	4.34 E-6	0.1061	293000
21	4.34 E-6	0.1148	295000
22	4.06 E-6	0.1232	297000

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0050	1000
2	0.0093	25000
3	0.0112	49000
4	0.0121	73000
5	0.0127	97000
6	0.0127	121000
7	0.0141	145000
8	0.0141	169000
9	0.0144	193000
10	0.0155	217000
11	0.0183	241000
12	0.0239	265000
13	0.0567	280000
14	0.0645	282000
15	0.0704	284000
16	0.0788	286000
17	0.0853	288000
18	0.0925	290000
19	0.1018	292000
20	0.1105	294000
21	0.1191	296000
22	0.1273	298000

TABLE 100

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 3-L-16, COMPRESSION-TENSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.3$ ,  $U_c=-1$ ,  $S=3.0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.4493	0.0025	10000	1000	2.52 E-6
1.4507	0.0014	35000	25000	5.60 E-8
1.4507	0.0000	60000	25000	0.00 E+0
1.4510	0.0003	85000	25000	1.12 E-8
1.4512	0.0003	110000	25000	1.12 E-8
1.4512	0.0000	135000	25000	0.00 E+0
1.4512	0.0000	160000	25000	0.00 E+0
1.4512	0.0000	185000	25000	0.00 E+0
1.4512	0.0000	210000	25000	0.00 E+0
1.4518	0.0006	235000	25000	2.24 E-8
1.4521	0.0003	260000	25000	1.12 E-8
1.4521	0.0000	285000	25000	0.00 E+0
1.4521	0.0000	310000	25000	0.00 E+0
1.4521	0.0000	335000	25000	0.00 E+0
1.4521	0.0000	360000	25000	0.00 E+0
1.4521	0.0000	385000	25000	0.00 E+0
1.4521	0.0000	410000	25000	0.00 E+0
1.4521	0.0000	435000	25000	0.00 E+0
1.4521	0.0000	460000	25000	0.00 E+0
1.4521	0.0000	485000	25000	0.00 E+0
1.4521	0.0000	510000	25000	0.00 E+0
1.4521	0.0000	535000	25000	0.00 E+0
1.4521	0.0000	560000	25000	0.00 E+0
1.4521	0.0000	585000	25000	0.00 E+0
1.4521	0.0000	610000	25000	0.00 E+0
1.4521	0.0000	635000	25000	0.00 E+0
1.4521	0.0000	660000	25000	0.00 E+0
1.4521	0.0000	685000	25000	0.00 E+0
1.4521	0.0000	710000	25000	0.00 E+0

Both crack tips shut-off.

TABLE 101

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 5-L-2, COMPRESSION-TENSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.1$ ,  $U_c=-1$ ,  $S=3.1$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.5431	0.0062	3000	1000	6.16 E-6
1.5478	0.0048	28000	25000	1.90 E-7
1.5481	0.0003	53000	25000	1.12 E-8
1.5490	0.0008	78000	25000	3.36 E-8
1.5495	0.0006	103000	25000	2.24 E-8
1.5495	0.0000	128000	25000	0.00 E+0
1.5495	0.0000	153000	25000	0.00 E+0
1.5495	0.0000	178000	25000	0.00 E+0
1.5495	0.0000	203000	25000	0.00 E+0
1.5495	0.0000	228000	25000	0.00 E+0
1.5495	0.0000	253000	25000	0.00 E+0
1.5495	0.0000	278000	25000	0.00 E+0
1.5501	0.0006	303000	25000	2.24 E-8
1.5501	0.0000	328000	25000	0.00 E+0
1.5501	0.0000	353000	25000	0.00 E+0
1.5501	0.0000	378000	25000	0.00 E+0
1.5506	0.0006	403000	25000	2.24 E-8
1.5966	0.0459	428000	25000	1.84 E-6
1.6083	0.0118	432000	4000	2.94 E-6

Test performed to zero-in on overload shut-off ratio. Test terminated prior to reaching  $(da/d_N)_c$ .

TABLE 102

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 2-L-4, COMPRESSION-TENSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.1$ ,  $U_c=-1$ ,  $S=3.2$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.5625	0.0042	10500	1000	4.20 E-6
0.5695	0.0070	35500	25000	2.80 E-7
0.5712	0.0017	60500	25000	6.72 E-8
0.5715	0.0003	85500	25000	1.12 E-8
0.5718	0.0003	110500	25000	1.12 E-8
0.5734	0.0018	210500	100000	1.68 E-8
0.5737	3.0000	310500	100000	2.80 E-9
0.5737	0.0000	410500	100000	0.00 E+0
0.5751	0.0015	510500	100000	1.40 E-8
0.5762	0.0011	610500	100000	2.24 E-8
0.5762	0.0000	635500	25000	0.00 E+0
0.5774	0.0110	660500	25000	4.48 E-8
0.5774	0.0000	685500	25000	0.00 E+0
0.5774	0.0000	710500	25000	0.00 E+0
0.5774	0.0000	735500	25000	0.00 E+0
0.5774	0.0000	760500	25000	0.00 E+0
0.5774	0.0000	785500	25000	0.00 E+0
0.5774	0.0000	810500	25000	0.00 E+0
0.5774	0.0000	835500	25000	0.00 E+0

$S=3.2$  considered to be overload shut-off ratio for this case.

Data Tabulations for Compression-Tension Load  
Class,  $K_2=7.78$  and 14 KSI  $\sqrt{\text{In.}}$

TABLE 103  
EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
TEMPERATURE DESICCATED AIR  
SPECIMEN NO. 6-L-21, COMPRESSION-TENSION  
F=12Hz, K2=7.78, R=0.1,  $U_c = -1.0$  S=1.5

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.5062	0.0020	40000	1000	1.96 E-6
0.5090	0.0028	42000	2000	1.40 E-6
0.5121	0.0031	44000	2000	1.54 E-6
0.5166	0.0045	46000	2000	2.24 E-6
0.5214	0.0048	48000	2000	2.38 E-6
0.5244	0.0031	50000	2000	1.54 E-6
0.5278	0.0034	52000	2000	1.68 E-6
0.5326	0.0048	54000	2000	2.38 E-6
RUN NO. 2				
0.5561	0.0011	67000	1000	1.12 E-6
0.5572	0.0011	69000	2000	5.60 E-7
0.5608	0.0036	71000	2000	1.82 E-6
0.5639	0.0031	73000	2000	1.54 E-6
0.5676	0.0036	75000	2000	1.82 E-6
0.5715	0.0039	77000	2000	1.96 E-6
0.5754	0.0039	79000	2000	1.96 E-6
0.5793	0.0039	81000	2000	1.96 E-6
RUN NO. 3				
0.5953	0.0020	90000	1000	1.96 E-6
0.5964	0.0011	92000	2000	5.60 E-7
0.5995	0.0031	94000	2000	1.54 E-6
0.6031	0.0036	96000	2000	1.82 E-6
0.6070	0.0039	98000	2000	1.96 E-6
0.6104	0.0034	100000	2000	1.68 E-6
0.6138	0.0034	102000	2000	1.68 E-6
0.6182	0.0045	104000	2000	2.24 E-6
RUN NO. 4				
0.6359	0.0025	113000	1000	2.52 E-6
0.6378	0.0020	115000	2000	9.80 E-7
0.6412	0.0034	117000	2000	1.68 E-6
0.6446	0.0034	119000	2000	1.68 E-6
0.6485	0.0039	121000	2000	1.96 E-6
0.6516	0.0031	123000	2000	1.54 E-6
0.6563	0.0048	125000	2000	2.38 E-6
0.6591	0.0028	127000	2000	1.40 E-6

TABLE 103 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	1.89 E-6	0.0009	500
2	8.75 E-7	0.0028	2000
3	1.65 E-6	0.0053	4000
4	1.82 E-6	0.0087	6000
5	2.03 E-6	0.0126	8000
6	1.68 E-6	0.0163	10000
7	1.93 E-6	0.0199	12000
8	2.00 E-6	0.0238	14000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0019	1000
2	0.0036	3000
3	0.0069	5000
4	0.0106	7000
5	0.0146	9000
6	0.0180	11000
7	0.0218	13000
8	0.0258	15000

TABLE 104

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 5-L-20, COMPRESSION-TENSION  
 $F=12\text{Hz}$ ,  $K_2=7.78$ ,  $R=0.1$ ,  $U_c=-1.0$ ,  $S=2.0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.3888	0.0011	24000	1000	1.12 E-6
1.3899	0.0011	28000	4000	2.80 E-7
1.3919	0.0020	32000	4000	4.90 E-7
1.3938	0.0020	34000	2000	9.80 E-7
1.3961	0.0022	36000	2000	1.12 E-6
1.3989	0.0028	38000	2000	1.40 E-6
1.4014	0.0025	40000	2000	1.26 E-6
1.4062	0.0048	42000	2000	2.38 E-6
1.4098	0.0036	44000	2000	1.82 E-6
1.4129	0.0031	46000	2000	1.54 E-6
1.4174	0.0045	48000	2000	2.24 E-6
1.4204	0.0031	50000	2000	1.54 E-6
RUN NO. 2				
1.4218	0.0014	51000	1000	1.40 E-6
1.4232	0.0014	55000	4000	3.50 E-7
1.4252	0.0020	59000	4000	4.90 E-7
1.4263	0.0011	61000	2000	5.60 E-7
1.4283	0.0020	63000	2000	9.80 E-7
1.4319	0.0036	65000	2000	1.82 E-6
1.4347	0.0028	67000	2000	1.40 E-6
1.4392	0.0045	69000	2000	2.24 E-6
1.4428	0.0036	71000	2000	1.82 E-6
1.4468	0.0039	73000	2000	1.96 E-6
1.4507	0.0039	75000	2000	1.96 E-6
1.4546	0.0039	77000	2000	1.96 E-6
RUN NO. 3				
1.4566	0.0020	78000	1000	1.96 E-6
1.4585	0.0020	82000	4000	4.90 E-7
1.4602	0.0017	86000	4000	4.20 E-7
1.4613	0.0011	88000	2000	5.60 E-7
1.4633	0.0020	90000	2000	9.80 E-7
1.4666	0.0034	92000	2000	1.68 E-6
1.4697	0.0031	94000	2000	1.54 E-6
1.4725	0.0028	96000	2000	1.40 E-6
1.4776	0.0050	98000	2000	2.52 E-6
1.4812	0.0036	100000	2000	1.82 E-6
1.4846	0.0034	102000	2000	1.68 E-6
1.4882	0.0036	104000	2000	1.82 E-6



TABLE 104 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	1.49 E-6	0.0007	500
2	3.73 E-7	0.0022	3000
3	4.67 E-7	0.0039	7000
4	7.00 E-7	0.0056	10000
5	1.03 E-6	0.0073	12000
6	1.63 E-6	0.0099	14000
7	1.40 E-6	0.0130	16000
8	2.01 E-6	0.0164	18000
9	2.05 E-6	0.0204	20000
10	1.77 E-6	0.0243	22000
11	1.96 E-6	0.0280	24000
12	1.77 E-6	0.0317	26000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0015	1000
2	0.0030	5000
3	0.0049	9000
4	0.0063	11000
5	0.0083	13000
6	0.0116	15000
7	0.0144	17000
8	0.0184	19000
9	0.0225	21000
10	0.0260	23000
11	0.0300	25000
12	0.0335	27000

TABLE 105

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 3-1-15, COMPRESSION-TENSION  
 $F=12\text{Hz}$ ,  $K_2=7.78$ ,  $R=0.1$ ,  $U_c=-1$ ,  $S=2.5$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.5681	0.0020	17250	1000	1.96 E-6
0.5701	0.0020	22250	5000	3.92 E-7
0.5706	0.0006	27250	5000	1.12 E-7
0.5712	0.0006	32250	5000	1.12 E-7
0.5720	0.0008	37250	5000	1.68 E-7
0.5734	0.0014	42250	5000	2.80 E-7
0.5740	0.0006	47250	5000	1.12 E-7
0.5751	0.0011	52250	5000	2.24 E-7
0.5765	0.0014	57250	5000	2.80 E-7
0.5796	0.0031	62250	5000	6.16 E-7
0.5818	0.0022	64250	2000	1.12 E-6
0.5838	0.0020	66250	2000	9.80 E-7
0.5866	0.0028	68250	2000	1.40 E-6
0.5900	0.0034	70250	2000	1.68 E-6
0.5939	0.0039	72250	2000	1.96 E-6
0.5981	0.0042	74250	2000	2.10 E-6
0.6031	0.0050	76250	2000	2.52 E-6
0.6087	0.0056	78250	2000	2.80 E-6
0.6132	0.0045	80250	2000	2.24 E-6
0.6171	0.0039	82250	2000	1.96 E-6
RUN NO. 2				
0.6462	0.0022	95250	1000	2.24 E-6
0.6474	0.0011	100250	5000	2.24 E-7
0.6485	0.0011	105250	5000	2.24 E-7
0.6493	0.0008	110250	5000	1.68 E-7
0.6504	0.0011	115250	5000	2.24 E-7
0.6518	0.0014	120250	5000	2.80 E-7
0.6530	0.0011	125250	5000	2.24 E-7
0.6535	0.0006	130250	5000	1.12 E-7
0.6560	0.0025	135250	5000	5.04 E-7
0.6594	0.0034	140250	5000	6.72 E-7
0.6622	0.0028	142250	2000	1.40 E-6
0.6647	0.0025	144250	2000	1.26 E-6
0.6670	0.0022	146250	2000	1.12 E-6
0.6695	0.0025	148250	2000	1.26 E-6
0.6748	0.0053	150250	2000	2.66 E-6
0.6784	0.0036	152250	2000	1.82 E-6
0.6835	0.0050	154250	2000	2.52 E-6
0.6882	0.0048	156250	2000	2.38 E-6
0.6919	0.0036	158250	2000	1.82 E-6
0.6955	0.0036	160250	2000	1.82 E-6

TABLE 105 (continued)

RUN NO. 3

0.7224	0.0025	173250	1000	2.52 E-6
0.7235	0.0011	178250	5000	2.24 E-7
0.7246	0.0011	183250	5000	2.24 E-7
0.7249	0.0003	188250	5000	5.60 E-8
0.7263	0.0014	193250	5000	2.80 E-7
0.7274	0.0011	198250	5000	2.24 E-7
0.7280	0.0006	203250	5000	1.12 E-7
0.7294	0.0014	208250	5000	2.80 E-7
0.7311	0.0017	213250	5000	3.36 E-7
0.7347	0.0036	218250	5000	7.28 E-7
0.7367	0.0020	220250	2000	9.80 E-7
0.7392	0.0025	222250	2000	1.26 E-6
0.7437	0.0045	224250	2000	2.24 E-6
0.7484	0.0048	226250	2000	2.38 E-6
0.7526	0.0042	228250	2000	2.10 E-6
0.7566	0.0039	230250	2000	1.96 E-6
0.7616	0.0050	232250	2000	2.52 E-6
0.7655	0.0039	234250	2000	1.96 E-6
0.7697	0.0042	236250	2000	2.10 E-6
0.7734	0.0036	238250	2000	1.82 E-6

TABLE 105 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	2.24 E-6	0.0011	500
2	2.80 E-7	0.0029	3500
3	1.87 E-7	0.0041	8500
4	1.12 E-7	0.0049	13500
5	2.24 E-7	0.0057	18500
6	2.61 E-7	0.0069	23500
7	1.49 E-7	0.0079	28500
8	2.05 E-7	0.0088	33500
9	3.73 E-7	0.0103	38500
10	6.72 E-7	0.0129	43500
11	1.17 E-6	0.0157	47000
12	1.17 E-6	0.0181	49000
13	1.59 E-6	0.0208	51000
14	1.77 E-6	0.0242	53000
15	2.24 E-6	0.0282	55000
16	1.96 E-6	0.0324	57000
17	2.52 E-6	0.0369	59000
18	2.38 E-6	0.0418	61000
19	2.05 E-6	0.0462	63000
20	1.87 E-6	0.0501	65000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0022	1000
2	0.0036	5000
3	0.0046	11000
4	0.0051	16000
5	0.0063	21000
6	0.0076	26000
7	0.0083	31000
8	0.0093	36000
9	0.0112	41000
10	0.0146	46000
11	0.0169	48000
12	0.0192	50000
13	0.0224	52000
14	0.0259	54000
15	0.0304	56000
16	0.0343	58000
17	0.0394	60000
18	0.0441	62000
19	0.0483	64000
20	0.0520	66000

TABLE 106

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 1-L-21, COMPRESSION-TENSION  
 $F=12\text{Hz}$ ,  $K_2=7.78$ ,  $R=0.1$ ,  $U_c=-1$ ,  $S=3$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.5309	0.0022	11000	1000	2.24 E-6
0.5351	0.0042	36000	25000	1.68 E-7
0.5359	0.0008	61000	25000	3.36 E-8
0.5365	0.0006	86000	25000	2.24 E-8
0.5376	0.0011	111000	25000	4.43 E-8
0.5410	0.0034	136000	25000	1.34 E-7
0.5701	0.0291	161000	25000	1.16 E-6
0.5734	0.0034	163000	2000	1.68 E-6
0.5779	0.0045	165000	2000	2.24 E-6
0.5813	0.0034	167000	2000	1.68 E-6
0.5849	0.0036	169000	2000	1.82 E-6
0.5874	0.0025	171000	2000	1.26 E-6
0.5914	0.0039	173000	2000	1.96 E-6
0.5936	0.0022	175000	2000	1.12 E-6
0.5970	0.0034	177000	2000	1.68 E-6
0.5998	0.0028	179000	2000	1.40 E-6
0.6026	0.0028	181000	2000	1.40 E-6
0.6056	0.0031	183000	2000	1.54 E-6
0.6096	0.0039	185000	2000	1.96 E-6
0.6129	0.0034	187000	2000	1.68 E-6
0.6160	0.0031	189000	2000	1.54 E-6
0.6188	0.0028	191000	2000	1.40 E-6
0.6222	0.0034	193000	2000	1.68 E-6
0.6255	0.0034	195000	2000	1.68 E-6
0.6283	0.0028	197000	2000	1.40 E-6
0.6306	0.0022	199000	2000	1.12 E-6
0.6339	0.0034	201000	2000	1.68 E-6
0.6373	0.0034	203000	2000	1.68 E-6
0.6412	0.0039	205000	2000	1.96 E-6

TABLE 106(continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/EN	TOT CRACK	TOT CYCLES
1	2.24 E-6	0.0211	500
2	1.68 E-7	0.0040	13500
3	3.36 E-8	0.0069	38500
4	2.24 E-8	0.0076	63500
5	4.48 E-8	0.0084	88500
6	1.34 E-7	0.0106	113500
7	1.16 E-6	0.0269	138500
8	1.68 E-6	0.0431	152000
9	2.24 E-6	0.0470	154000
10	1.68 E-6	0.0510	156000
11	1.62 E-6	0.0545	158000
12	1.26 E-6	0.0575	160000
13	1.96 E-6	0.0608	162000
14	1.12 E-6	0.0630	164000
15	1.68 E-6	0.0666	166000
16	1.40 E-6	0.0697	168000
17	1.48 E-6	0.0725	170000
18	1.54 E-6	0.0755	172000
19	1.96 E-6	0.0790	174000
20	1.68 E-6	0.0826	176000
21	1.54 E-6	0.0858	178000
22	1.48 E-6	0.0888	180000
23	1.68 E-6	0.0918	182000
24	1.68 E-6	0.0952	184000
25	1.40 E-6	0.0983	186000
26	1.12 E-6	0.1008	188000
27	1.68 E-6	0.1036	190000
28	1.68 E-6	0.1070	192000
29	1.96 E-6	0.1106	194000

TABLE 106 (continued)

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0022	1000
2	0.0064	26000
3	0.0073	51000
4	0.0078	76000
5	0.0090	101000
6	0.0123	126000
7	0.0414	151000
8	0.0448	153000
9	0.0493	155000
10	0.0526	157000
11	0.0563	159000
12	0.0583	161000
13	0.0627	163000
14	0.0650	165000
15	0.0683	167000
16	0.0711	169000
17	0.0739	171000
18	0.0770	173000
19	0.0809	175000
20	0.0843	177000
21	0.0874	179000
22	0.0902	181000
23	0.0935	183000
24	0.0969	185000
25	0.0997	187000
26	0.1019	189000
27	0.1053	191000
28	0.1086	193000
29	0.1126	195000

TABLE 107

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 4-L-21, COMPRESSION-TENSION  
 $F=12\text{Hz}$ ,  $K_2=7.78$ ,  $R=0.1$ ,  $U_c=-1$ ,  $S=3.1$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.0660	0.0025	78250	1000	2.52 E-6
1.0676	0.0017	103250	25000	6.72 E-8
1.0676	0.0000	128250	25000	0.00 E+0
1.0676	0.0000	153250	25000	0.00 E+0
1.0682	0.0006	178250	25000	2.24 E-8
1.0690	0.0008	203250	25000	3.36 E-8
1.0690	0.0000	228250	25000	0.00 E+0
1.0690	0.0000	253250	25000	0.00 E+0
1.0690	0.0000	278250	25000	0.00 E+0
1.0690	0.0000	303250	25000	0.00 E+0
1.0690	0.0000	328250	25000	0.00 E+0
1.0690	0.0000	353250	25000	0.00 E+0
1.0690	0.0000	378250	25000	0.00 E+0
1.0690	0.0000	403250	25000	0.00 E+0
1.0690	0.0000	428250	25000	0.00 E+0
1.0690	0.0000	453250	25000	0.00 E+0
1.0690	0.0000	478250	25000	0.00 E+0
1.0690	0.0000	503250	25000	0.00 E+0
1.0690	0.0000	528250	25000	0.00 E+0
1.0690	0.0000	553250	25000	0.00 E+0
1.0690	0.0000	578250	25000	0.00 E+0
1.0690	0.0000	603250	25000	0.00 E+0
1.0690	0.0000	628250	25000	0.00 E+0
1.0690	0.0000	653250	25000	0.00 E+0
1.0690	0.0000	678250	25000	0.00 E+0
1.0690	0.0000	703250	25000	0.00 E+0
1.0690	0.0000	728250	25000	0.00 E+0
1.0690	0.0000	753250	25000	0.00 E+0
1.0690	0.0000	778250	25000	0.00 E+0

$S=3.1$  considered to be overload shut-off ratio for this case.



TABLE 108

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 6-L-20, COMPRESSION-TENSION  
 F=12Hz, K2=14, R=0.5,  $U_0 = -1$ , S=1.5

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.5001	0.0028	16000	1000	2.80 E-6
0.5001	0.0000	17000	1000	0.00 E+0
0.5012	0.0011	18000	1000	1.12 E-6
0.5026	0.0014	19000	1000	1.40 E-6
0.5034	0.0008	20000	1000	8.40 E-7
0.5057	0.0022	21000	1000	2.24 E-6
0.5090	0.0034	22000	1000	3.36 E-6
0.5118	0.0028	23000	1000	2.80 E-6
0.5158	0.0039	24000	1000	3.92 E-6
0.5202	0.0045	25000	1000	4.48 E-6
0.5247	0.0045	26000	1000	4.48 E-6
0.5292	0.0045	27000	1000	4.48 E-6
0.5331	0.0039	28000	1000	3.92 E-6
0.5376	0.0045	29000	1000	4.48 E-6
RUN NO. 2				
0.5407	0.0031	30000	1000	3.08 E-6
0.5424	0.0017	31000	1000	1.68 E-6
0.5426	0.0003	32000	1000	2.80 E-7
0.5438	0.0011	33000	1000	1.12 E-6
0.5454	0.0017	34000	1000	1.68 E-6
0.5471	0.0017	35000	1000	1.68 E-6
0.5499	0.0028	36000	1000	2.80 E-6
0.5533	0.0034	37000	1000	3.36 E-6
0.5572	0.0039	38000	1000	3.92 E-6
0.5606	0.0034	39000	1000	3.36 E-6
0.5662	0.0056	40000	1000	5.60 E-6
0.5701	0.0039	41000	1000	3.92 E-6
0.5743	0.0042	42000	1000	4.20 E-6
0.5785	0.0042	43000	1000	4.20 E-6

TABLE 108 (continued)

## RUN NO. 3

0.5813	0.0028	44000	1000	2.80 E-6
0.5818	0.0006	45000	1000	5.60 E-7
0.5827	0.0008	46000	1000	8.40 E-7
0.5832	0.0006	47000	1000	5.60 E-7
0.5846	0.0014	48000	1000	1.40 E-6
0.5874	0.0028	49000	1000	2.80 E-6
0.5914	0.0039	50000	1000	3.92 E-6
0.5950	0.0036	51000	1000	3.64 E-6
0.5984	0.0034	52000	1000	3.36 E-6
0.6042	0.0059	53000	1000	5.88 E-6
0.6079	0.0036	54000	1000	3.64 E-6
0.6126	0.0048	55000	1000	4.76 E-6
0.6168	0.0042	56000	1000	4.20 E-6
0.6213	0.0045	57000	1000	4.48 E-6

## RUN NO. 4

0.6619	0.0020	67000	1000	1.96 E-6
0.6630	0.0011	68000	1000	1.12 E-6
0.6639	0.0008	69000	1000	8.40 E-7
0.6656	0.0017	70000	1000	1.68 E-6
0.6670	0.0014	71000	1000	1.40 E-6
0.6709	0.0039	72000	1000	3.92 E-6
0.6728	0.0020	73000	1000	1.96 E-6
0.6756	0.0028	74000	1000	2.80 E-6
0.6815	0.0059	75000	1000	5.88 E-6
0.6849	0.0034	76000	1000	3.36 E-6
0.6894	0.0045	77000	1000	4.48 E-6
0.6947	0.0053	78000	1000	5.32 E-6
0.6980	0.0034	79000	1000	3.36 E-6
0.7045	0.0064	80000	1000	6.44 E-6

TABLE 108 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	2.66 E-6	0.0013	500
2	8.40 E-7	0.0031	1500
3	7.70 E-7	0.0039	2500
4	1.19 E-6	0.0049	3500
5	1.33 E-6	0.0061	4500
6	2.66 E-6	0.0081	5500
7	3.01 E-6	0.0110	6500
8	3.15 E-6	0.0140	7500
9	4.27 E-6	0.0177	8500
10	4.27 E-6	0.0220	9500
11	4.55 E-6	0.0264	10500
12	4.62 E-6	0.0310	11500
13	3.92 E-6	0.0353	12500
14	4.90 E-6	0.0397	13500

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0027	1000
2	0.0035	2000
3	0.0043	3000
4	0.0055	4000
5	0.0068	5000
6	0.0095	6000
7	0.0125	7000
8	0.0156	8000
9	0.0199	9000
10	0.0242	10000
11	0.0287	11000
12	0.0333	12000
13	0.0372	13000
14	0.0421	14000

TABLE 109

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 3-L-14, COMPRESSION-TENSION  
 $F=12\text{Hz}$ ,  $K_2=14$ ,  $R=0.5$ ,  $U_c=-1$ ,  $S=2.0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.7818	0.0034	30000	1000	3.36 E-6
0.7846	0.0028	38000	8000	3.50 E-7
0.7868	0.0022	46000	8000	2.80 E-7
0.7868	0.0000	54000	8000	0.00 E+0
0.7871	0.0003	62000	8000	3.50 E-8
0.7879	0.0008	70000	8000	1.05 E-7
0.7885	0.0006	74000	4000	1.40 E-7
0.7890	0.0006	78000	4000	1.40 E-7
0.7902	0.0011	80000	2000	5.60 E-7
0.7930	0.0028	82000	2000	1.40 E-6
0.7944	0.0014	83000	1000	1.40 E-6
0.7980	0.0036	84000	1000	3.64 E-6
0.8014	0.0034	85000	1000	3.36 E-6
0.8047	0.0034	86000	1000	3.36 E-6
0.8086	0.0039	87000	1000	3.92 E-6
0.8126	0.0039	88000	1000	3.92 E-6
0.8170	0.0045	89000	1000	4.48 E-6
0.8210	0.0039	90000	1000	3.92 E-6
0.8252	0.0042	91000	1000	4.20 E-6
0.8294	0.0042	92000	1000	4.20 E-6
0.8333	0.0039	93000	1000	3.92 E-6
0.8378	0.0045	94000	1000	4.48 E-6
0.8428	0.0050	95000	1000	5.04 E-6

TABLE 109 (continued)

RUN NO. 2

0.8722	0.0025	102000	1000	2.52 E-6
0.8747	0.0025	110000	8000	3.15 E-7
0.8758	0.0011	118000	8000	1.40 E-7
0.8770	0.0011	126000	8000	1.40 E-7
0.8772	0.0003	134000	8000	3.50 E-8
0.8775	0.0003	142000	8000	3.50 E-8
0.8778	0.0003	146000	4000	7.00 E-8
0.8786	0.0008	150000	4000	2.10 E-7
0.8795	0.0008	152000	2000	4.20 E-7
0.8800	0.0006	154000	2000	2.80 E-7
0.8806	0.0006	155000	1000	5.60 E-7
0.8814	0.0008	156000	1000	8.40 E-7
0.8820	0.0006	157000	1000	5.60 E-7
0.8837	0.0017	158000	1000	1.68 E-6
0.8859	0.0022	159000	1000	2.24 E-6
0.8893	0.0034	160000	1000	3.36 E-6
0.8907	0.0014	161000	1000	1.40 E-6
0.8954	0.0048	162000	1000	4.76 E-6
0.9010	0.0056	163000	1000	5.60 E-6
0.9055	0.0045	164000	1000	4.48 E-6
0.9100	0.0045	165000	1000	4.48 E-6
0.9145	0.0045	166000	1000	4.48 E-6
0.9198	0.0053	167000	1000	5.32 E-6

TABLE 109 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	2.94 E-6	0.0015	500
2	3.32 E-7	0.0043	5000
3	2.10 E-7	0.0064	13000
4	7.00 E-8	0.0075	21000
5	3.50 E-8	0.0080	29000
6	7.00 E-8	0.0084	37000
7	1.05 E-7	0.0089	43000
8	1.75 E-7	0.0094	47000
9	4.90 E-7	0.0103	50000
10	8.40 E-7	0.0116	52000
11	9.80 E-7	0.0130	53500
12	2.24 E-6	0.0146	54500
13	1.96 E-6	0.0167	55500
14	2.52 E-6	0.0189	56500
15	3.08 E-6	0.0217	57500
16	3.64 E-6	0.0251	58500
17	2.94 E-6	0.0284	59500
18	4.34 E-6	0.0320	60500
19	4.90 E-6	0.0366	61500
20	4.34 E-6	0.0412	62500
21	4.20 E-6	0.0455	63500
22	4.48 E-6	0.0498	64500
23	5.18 E-6	0.0547	65500

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0029	1000
2	0.0056	9000
3	0.0073	17000
4	0.0078	25000
5	0.0081	33000
6	0.0086	41000
7	0.0091	45000
8	0.0098	49000
9	0.0108	51000
10	0.0125	53000
11	0.0134	54000
12	0.0157	55000
13	0.0176	56000
14	0.0202	57000
15	0.0233	58000
16	0.0269	59000
17	0.0298	60000
18	0.0342	61000
19	0.0391	62000
20	0.0434	63000
21	0.0476	64000
22	0.0521	65000
23	0.0573	66000

TABLE 110

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 3-L-14, COMPRESSION-TENSION  
 $F=12\text{Hz}$ ,  $K_2=14$ ,  $R=0.5$ ,  $U_c=-1.0$ ,  $S=2.5$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.1312	0.0031	9000	1000	3.08 E-6
1.1334	0.0022	29000	20000	1.12 E-7
1.1351	0.0017	129000	100000	1.68 E-8
1.1357	0.0006	229000	100000	5.60 E-9
1.1357	0.0000	429000	100000	0.00 E+0
1.1357	0.0000	429000	100000	0.00 E+0
1.1357	0.0000	529000	100000	0.00 E+0
1.1357	0.0000	629000	100000	0.00 E+0
1.1357	0.0000	729000	100000	0.00 E+0

Both crack tips shut-off.

TABLE 111

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 1-L-1, COMPRESSION-TENSION  
 $F=12\text{Hz}$ ,  $K_2=14$ ,  $R=0.5$ ,  $U_c=-1$ ,  $S=2.1$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.7343	0.0017	2000	1000	1.68 E-6
1.7366	0.0022	27000	25000	8.96 E-8
1.7371	0.0006	52000	25000	2.24 E-8
1.7427	0.0056	77000	25000	2.24 E-7
1.7520	0.0092	82000	5000	1.85 E-6

Test performed to zero-in on overload shut-off ratio. Test terminated prior to reaching  $(da/dN)_c$ .



TABLE 112

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 4-L-21, COMPRESSION-TENSION  
 $F=12\text{Hz}$ ,  $K_2=14$ ,  $R=0.5$ ,  $U_c=-1$ ,  $S=2.2$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO, 1				
0.4519	0.0025	2000	1000	2.52 E-6
0.4544	0.0025	27000	25000	1.01 E-7
0.4547	0.0003	52000	25000	1.12 E-8
0.4564	0.0017	77000	25000	6.72 E-8
0.4564	0.0000	102000	25000	0.00 E+0
0.4564	0.0000	127000	25000	0.00 E+0
0.4564	0.0000	152000	25000	0.00 E+0
0.4564	0.0000	177000	25000	0.00 E+0
0.4564	0.0000	202000	25000	0.00 E+0
0.4564	0.0000	227000	25000	0.00 E+0
0.4570	0.0006	252000	25000	2.24 E-8
0.4822	0.0252	270250	18250	1.38 E-6

Test performed to zero-in on overload shut-off ratio. Test terminated prior to reaching  $(da/dN)_c$ .

TABLE 113

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 1-L-1, COMPRESSION-TENSION  
 $F=12\text{Hz}$ ,  $K_2=14$ ,  $R=0.5$ ,  $U_c = -1$ ,  $S=2.3$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.5854	0.0025	3000	1000	2.52 E-6
1.5854	0.0000	28000	25000	0.00 E+0
1.5868	0.0014	53000	25000	5.60 E-8
1.5868	0.0000	78000	25000	0.00 E+0
1.5868	0.0000	103000	25000	0.00 E+0
1.5868	0.0000	128000	25000	0.00 E+0
1.5870	0.0003	153000	25000	1.12 E-8
1.5898	0.0028	178000	25000	1.12 E-7
1.5904	0.0006	203000	25000	2.24 E-8
1.5904	0.0000	228000	25000	0.00 E+0
1.5904	0.0000	253000	25000	0.00 E+0
1.5904	0.0000	278000	25000	0.00 E+0
1.5904	0.0000	303000	25000	0.00 E+0
1.5904	0.0000	328000	25000	0.00 E+0
1.5904	0.0000	353000	25000	0.00 E+0
1.5904	0.0000	378000	25000	0.00 E+0
1.5904	0.0000	403000	25000	0.00 E+0
1.5904	0.0000	428000	25000	0.00 E+0
1.5904	0.0000	453000	25000	0.00 E+0
1.5904	0.0000	478000	25000	0.00 E+0
1.5904	0.0000	503000	25000	0.00 E+0
1.5904	0.0000	528000	25000	0.00 E+0
1.5904	0.0000	553000	25000	0.00 E+0
1.5904	0.0000	578000	25000	0.00 E+0
1.5904	0.0000	603000	25000	0.00 E+0
1.5904	0.0000	628000	25000	0.00 E+0
1.5904	0.0000	653000	25000	0.00 E+0
1.5904	0.0000	678000	25000	0.00 E+0
1.5904	0.0000	703000	25000	0.00 E+0

$S=2.3$  considered to be overload shut-off ratio for this case.

Data Tabulations for Tension-Compression Load  
Class,  $K_2=10 \text{ KSI } \sqrt{\text{In.}}$

TABLE 114  
EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
TEMPERATURE DESICCATED AIR  
SPECIMEN 2-I-7, TENSION-COMPRESSION  
F=12Hz, K2=10, R=0.1,  $U_c = -.67$ , S=1.0

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.6675	0.0050	7000	1000	5.04 E-6
0.6720	0.0045	8000	1000	4.48 E-6
0.6776	0.0056	9000	1000	5.60 E-6
0.6821	0.0045	10000	1000	4.48 E-6
0.6866	0.0045	11000	1000	4.48 E-6
0.6916	0.0050	12000	1000	5.04 E-6
0.6972	0.0056	13000	1000	5.60 E-6
0.7017	0.0045	14000	1000	4.48 E-6
RUN NO. 2				
0.7067	0.0050	15000	1000	5.04 E-6
0.7118	0.0050	16000	1000	5.04 E-6
0.7174	0.0056	17000	1000	5.60 E-6
0.7224	0.0050	18000	1000	5.04 E-6
0.7286	0.0062	19000	1000	6.16 E-6
0.7330	0.0045	20000	1000	4.48 E-6
0.7375	0.0045	21000	1000	4.48 E-6
0.7420	0.0045	22000	1000	4.48 E-6
RUN NO. 3				
0.7465	0.0045	23000	1000	4.48 E-6
0.7510	0.0045	24000	1000	4.48 E-6
0.7566	0.0056	25000	1000	5.60 E-6
0.7622	0.0056	26000	1000	5.60 E-6
0.7678	0.0056	27000	1000	5.60 E-6
0.7722	0.0045	28000	1000	4.48 E-6
0.7773	0.0050	29000	1000	5.04 E-6
0.7823	0.0050	30000	1000	5.04 E-6
RUN NO. 4				
0.7868	0.0045	31000	1000	4.48 E-6
0.7918	0.0050	32000	1000	5.04 E-6
0.7974	0.0056	33000	1000	5.60 E-6
0.8025	0.0050	34000	1000	5.04 E-6
0.8075	0.0050	35000	1000	5.04 E-6
0.8120	0.0045	36000	1000	4.48 E-6
0.8182	0.0062	37000	1000	6.16 E-6
0.8232	0.0050	38000	1000	5.04 E-6

TABLE 114 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	.DA/DN	TOT CRACK	TOT CYCLES
1	4.76 E-6	0.0024	500
2	4.76 E-6	0.0071	1500
3	5.60 E-6	0.0123	2500
4	5.04 E-6	0.0176	3500
5	5.32 E-6	0.0228	4500
6	4.62 E-6	0.0278	5500
7	5.32 E-6	0.0328	6500
8	4.76 E-6	0.0378	7500

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0048	1000
2	0.0095	2000
3	0.0151	3000
4	0.0202	4000
5	0.0255	5000
6	0.0301	6000
7	0.0354	7000
8	0.0402	8000

TABLE 115  
EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
TEMPERATURE DESICCATED AIR  
SPECIMEN 2-L-7, TENSION-COMPRESSION  
F=12Hz, K2=10, R=0.5,  $U_c = -.67$ , S=1.0

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.5208	0.0034	26000	2000	1.68 E-6
0.5219	0.0011	28000	2000	5.60 E-7
0.5242	0.0022	30000	2000	1.12 E-6
0.5264	0.0022	32000	2000	1.12 E-6
0.5286	0.0022	34000	2000	1.12 E-6
0.5326	0.0039	36000	2000	1.96 E-6
0.5337	0.0011	38000	2000	5.60 E-7
0.5359	0.0022	40000	2000	1.12 E-6
0.5387	0.0028	42000	2000	1.40 E-6
RUN NO. 2				
0.5398	0.0011	44000	2000	5.60 E-7
0.5426	0.0028	46000	2000	1.40 E-6
0.5449	0.0022	48000	2000	1.12 E-6
0.5471	0.0022	50000	2000	1.12 E-6
0.5494	0.0022	52000	2000	1.12 E-6
0.5510	0.0017	54000	2000	8.40 E-7
0.5533	0.0022	56000	2000	1.12 E-6
0.5550	0.0017	58000	2000	8.40 E-7
0.5572	0.0022	60000	2000	1.12 E-6
RUN NO. 3				
0.5611	0.0017	64000	2000	8.40 E-7
0.5628	0.0017	66000	2000	8.40 E-7
0.5650	0.0022	68000	2000	1.12 E-6
0.5673	0.0022	70000	2000	1.12 E-6
0.5695	0.0022	72000	2000	1.12 E-6
0.5718	0.0022	74000	2000	1.12 E-6
0.5734	0.0017	76000	2000	8.40 E-7
0.5762	0.0028	78000	2000	1.40 E-6
0.5779	0.0017	80000	2000	8.40 E-7

TABLE 115 (continued)

## RUN NO. 4

0.5824	0.0022	84000	2000	1.12 E-6
0.5846	0.0022	86000	2000	1.12 E-6
0.5863	0.0017	88000	2000	8.40 E-7
0.5886	0.0022	90000	2000	1.12 E-6
0.5902	0.0017	92000	2000	8.40 E-7
0.5919	0.0017	94000	2000	8.40 E-7
0.5947	0.0028	96000	2000	1.40 E-6
0.5964	0.0017	98000	2000	8.40 E-7
0.5986	0.0022	100000	2000	1.12 E-6

## RUN NO. 5

0.6031	0.0017	104000	2000	8.40 E-7
0.6059	0.0028	106000	2000	1.40 E-6
0.6076	0.0017	108000	2000	8.40 E-7
0.6093	0.0017	110000	2000	8.40 E-7
0.6110	0.0017	112000	2000	8.40 E-7
0.6132	0.0022	114000	2000	1.12 E-6
0.6143	0.0011	116000	2000	5.60 E-7
0.6160	0.0017	118000	2000	8.40 E-7
0.6177	0.0017	120000	2000	8.40 E-7

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	1.01 E-6	0.0010	1000
2	1.06 E-6	0.0031	3000
3	1.01 E-6	0.0052	5000
4	1.06 E-6	0.0072	7000
5	1.01 E-6	0.0093	9000
6	1.18 E-6	0.0115	11000
7	8.96 E-7	0.0136	13000
8	1.01 E-6	0.0155	15000
9	1.06 E-6	0.0175	17000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0020	2000
2	0.0041	4000
3	0.0062	6000
4	0.0083	8000
5	0.0103	10000
6	0.0127	12000
7	0.0144	14000
8	0.0165	16000
9	0.0186	18000

TABLE 116  
EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
TEMPERATURE DESICCATED AIR  
SPECIMEN 4-L-14, TENSION-COMPRESSION  
F=12Hz, K2=10, R=0.1,  $U_c = -1.0$ , S=1.5

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.5762	0.0045	9000	1000	4.48 E-6
0.5796	0.0034	10000	1000	3.36 E-6
0.5830	0.0034	11000	1000	3.36 E-6
0.5869	0.0039	12000	1000	3.92 E-6
0.5908	0.0039	13000	1000	3.92 E-6
0.5953	0.0045	14000	1000	4.48 E-6
0.5998	0.0045	15000	1000	4.48 E-6
0.6042	0.0045	16000	1000	4.48 E-6
0.6087	0.0045	17000	1000	4.48 E-6
RUN NO. 2				
0.6121	0.0034	18000	1000	3.36 E-6
0.6154	0.0034	19000	1000	3.36 E-6
0.6194	0.0039	20000	1000	3.92 E-6
0.6233	0.0039	21000	1000	3.92 E-6
0.6278	0.0045	22000	1000	4.48 E-6
0.6322	0.0045	23000	1000	4.48 E-6
0.6367	0.0045	24000	1000	4.48 E-6
0.6406	0.0039	25000	1000	3.92 E-6
0.6446	0.0039	26000	1000	3.92 E-6
RUN NO. 3				
0.6485	0.0039	27000	1000	3.92 E-6
0.6513	0.0028	28000	1000	2.80 E-6
0.6552	0.0039	29000	1000	3.92 E-6
0.6591	0.0039	30000	1000	3.92 E-6
0.6642	0.0050	31000	1000	5.04 E-6
0.6686	0.0045	32000	1000	4.48 E-6
0.6731	0.0045	33000	1000	4.48 E-6
0.6782	0.0050	34000	1000	5.04 E-6
0.6826	0.0045	35000	1000	4.48 E-6



TABLE 116 (continued)

AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	3.92 E-6	0.0020	500
2	3.17 E-6	0.0055	1500
3	3.73 E-6	0.0090	2500
4	3.92 E-6	0.0128	3500
5	4.48 E-6	0.0170	4500
6	4.48 E-6	0.0215	5500
7	4.48 E-6	0.0259	6500
8	4.48 E-6	0.0304	7500
9	4.29 E-6	0.0348	8500

AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0039	1000
2	0.0071	2000
3	0.0108	3000
4	0.0147	4000
5	0.0192	5000
6	0.0237	6000
7	0.0282	7000
8	0.0327	8000
9	0.0370	9000

TABLE 117  
EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
TEMPERATURE DESICCATED AIR  
SPECIMEN 4-L-14, TENSION-COMPRESSION  
F=12Hz, K2=10, R=0.1,  $U_c = -2.0$ , S=1.5

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.7252	0.0039	11000	1000	3.92 E-6
0.7274	0.0022	12000	1000	2.24 E-6
0.7302	0.0028	13000	1000	2.80 E-6
0.7347	0.0045	14000	1000	4.48 E-6
0.7392	0.0045	15000	1000	4.48 E-6
0.7442	0.0050	16000	1000	5.04 E-6
0.7482	0.0039	17000	1000	3.92 E-6
0.7526	0.0045	18000	1000	4.48 E-6
0.7571	0.0045	19000	1000	4.48 E-6
0.7622	0.0050	20000	1000	5.04 E-6
RUN NO. 2				
0.7666	0.0045	21000	1000	4.48 E-6
0.7694	0.0028	22000	1000	2.80 E-6
0.7717	0.0022	23000	1000	2.24 E-6
0.7756	0.0039	24000	1000	3.92 E-6
0.7801	0.0045	25000	1000	4.48 E-6
0.7846	0.0045	26000	1000	4.48 E-6
0.7890	0.0045	27000	1000	4.48 E-6
0.7930	0.0039	28000	1000	3.92 E-6
0.7986	0.0056	29000	1000	5.60 E-6
0.8025	0.0039	30000	1000	3.92 E-6
RUN NO. 3				
0.8075	0.0050	31000	1000	5.04 E-6
0.8098	0.0022	32000	1000	2.24 E-6
0.8126	0.0028	33000	1000	2.80 E-6
0.8176	0.0050	34000	1000	5.04 E-6
0.8215	0.0039	35000	1000	3.92 E-6
0.8254	0.0039	36000	1000	3.92 E-6
0.8299	0.0045	37000	1000	4.48 E-6
0.8350	0.0050	38000	1000	5.04 E-6
0.8394	0.0045	39000	1000	4.48 E-6
0.8450	0.0056	40000	1000	5.60 E-6

TABLE 117 (continued)

RUN NO. 4

0.8478	0.0028	41000	1000	2.80 E-6
0.8506	0.0028	42000	1000	2.80 E-6
0.8546	0.0039	43000	1000	3.92 E-6
0.8574	0.0028	44000	1000	2.80 E-6
0.8613	0.0039	45000	1000	3.92 E-6
0.8669	0.0056	46000	1000	5.60 E-6
0.8702	0.0034	47000	1000	3.36 E-6
0.8753	0.0050	48000	1000	5.04 E-6
0.8786	0.0034	49000	1000	3.36 E-6
0.8826	0.0039	50000	1000	3.92 E-6

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	4.06 E-6	0.0020	500
2	2.52 E-6	0.0053	1500
3	2.94 E-6	0.0080	2500
4	4.06 E-6	0.0116	3500
5	4.20 E-6	0.0157	4500
6	4.76 E-6	0.0202	5500
7	4.06 E-6	0.0246	6500
8	4.62 E-6	0.0289	7500
9	4.48 E-6	0.0335	8500
10	4.62 E-6	0.0380	9500

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0041	1000
2	0.0066	2000
3	0.0095	3000
4	0.0136	4000
5	0.0178	5000
6	0.0225	6000
7	0.0266	7000
8	0.0312	8000
9	0.0357	9000
10	0.0403	10000

TABLE 118  
EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
TEMPERATURE DESICCATED AIR  
SPECIMEN NO. 6-L-3, TENSION-COMPRESSION  
F=12Hz, K2=10, R=0.3,  $U_c = -1$ , S=1.5

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.4165	0.0036	22000	1000	3.64 E-6
1.4185	0.0020	23000	1000	1.96 E-6
1.4218	0.0034	24000	1000	3.36 E-6
1.4238	0.0020	25000	1000	1.96 E-6
1.4263	0.0025	26000	1000	2.52 E-6
1.4294	0.0031	27000	1000	3.08 E-6
1.4333	0.0039	28000	1000	3.92 E-6
1.4370	0.0036	29000	1000	3.64 E-6
1.4398	0.0028	30000	1000	2.80 E-6
1.4434	0.0036	31000	1000	3.64 E-6
1.4465	0.0031	32000	1000	3.08 E-6
RUN NO. 2				
1.4490	0.0025	33000	1000	2.52 E-6
1.4507	0.0017	34000	1000	1.68 E-6
1.4535	0.0028	35000	1000	2.80 E-6
1.4566	0.0031	36000	1000	3.08 E-6
1.4599	0.0034	37000	1000	3.36 E-6
1.4633	0.0034	38000	1000	3.36 E-6
1.4666	0.0034	39000	1000	3.36 E-6
1.4700	0.0034	40000	1000	3.36 E-6
1.4742	0.0042	41000	1000	4.20 E-6
1.4770	0.0028	42000	1000	2.80 E-6
1.4804	0.0034	43000	1000	3.36 E-6
RUN NO. 3				
1.4832	0.0028	44000	1000	2.80 E-6
1.4857	0.0025	45000	1000	2.52 E-6
1.4879	0.0022	46000	1000	2.24 E-6
1.4904	0.0025	47000	1000	2.52 E-6
1.4927	0.0022	48000	1000	2.24 E-6
1.4960	0.0034	49000	1000	3.36 E-6
1.4994	0.0034	50000	1000	3.36 E-6
1.5030	0.0036	51000	1000	3.64 E-6
1.5070	0.0039	52000	1000	3.92 E-6
1.5098	0.0028	53000	1000	2.80 E-6
1.5128	0.0031	54000	1000	3.08 E-6

TABLE 118 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	2.99 E-6	0.0015	500
2	2.05 E-6	0.0040	1500
3	2.80 E-6	0.0064	2500
4	2.52 E-6	0.0091	3500
5	2.71 E-6	0.0117	4500
6	3.27 E-6	0.0147	5500
7	3.55 E-6	0.0181	6500
8	3.55 E-6	0.0217	7500
9	3.64 E-6	0.0252	8500
10	3.08 E-6	0.0286	9500
11	3.17 E-6	0.0317	10500

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0030	1000
2	0.0050	2000
3	0.0078	3000
4	0.0104	4000
5	0.0131	5000
6	0.0163	6000
7	0.0199	7000
8	0.0234	8000
9	0.0271	9000
10	0.0301	10000
11	0.0333	11000

TABLE 119

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 6-L-3, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K2=10$ ,  $R=0.3$ ,  $U_c=-2$ ,  $S=1.5$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.1105	0.0031	8000	1000	3.08 E-6
1.1130	0.0025	9000	1000	2.52 E-6
1.1147	0.0017	10000	1000	1.68 E-6
1.1169	0.0022	11000	1000	2.24 E-6
1.1194	0.0025	12000	1000	2.52 E-6
1.1220	0.0025	13000	1000	2.52 E-6
1.1253	0.0034	14000	1000	3.36 E-6
1.1290	0.0036	15000	1000	3.64 E-6
1.1326	0.0036	16000	1000	3.64 E-6
1.1362	0.0036	17000	1000	3.64 E-6
1.1390	0.0028	18000	1000	2.80 E-6
1.1418	0.0028	19000	1000	2.80 E-6
1.1452	0.0034	20000	1000	3.36 E-6
RUN NO. 2				
1.1480	0.0028	21000	1000	2.80 E-6
1.1502	0.0022	22000	1000	2.24 E-6
1.1525	0.0022	23000	1000	2.24 E-6
1.1547	0.0022	24000	1000	2.24 E-6
1.1575	0.0028	25000	1000	2.80 E-6
1.1609	0.0034	26000	1000	3.36 E-6
1.1642	0.0034	27000	1000	3.36 E-6
1.1668	0.0025	28000	1000	2.52 E-6
1.1701	0.0034	29000	1000	3.36 E-6
1.1732	0.0031	30000	1000	3.08 E-6
1.1763	0.0031	31000	1000	3.08 E-6
1.1799	0.0036	32000	1000	3.64 E-6
1.1830	0.0031	33000	1000	3.08 E-6
RUN NO. 3				
1.1864	0.0034	34000	1000	3.36 E-6
1.1878	0.0014	35000	1000	1.40 E-6
1.1897	0.0020	36000	1000	1.96 E-6
1.1928	0.0031	37000	1000	3.08 E-6
1.1959	0.0031	38000	1000	3.08 E-6
1.1990	0.0031	39000	1000	3.08 E-6
1.2026	0.0036	40000	1000	3.64 E-6
1.2054	0.0028	41000	1000	2.80 E-6
1.2090	0.0036	42000	1000	3.64 E-6
1.2118	0.0028	43000	1000	2.80 E-6
1.2155	0.0036	44000	1000	3.64 E-6
1.2191	0.0036	45000	1000	3.64 E-6
1.2228	0.0036	46000	1000	3.64 E-6

(273)

TABLE 119 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	3.08 E-6	0.0015	500
2	2.05 E-6	0.0041	1500
3	1.96 E-6	0.0061	2500
4	2.52 E-6	0.0084	3500
5	2.80 E-6	0.0110	4500
6	2.99 E-6	0.0139	5500
7	3.45 E-6	0.0171	6500
8	2.99 E-6	0.0203	7500
9	3.55 E-6	0.0236	8500
10	3.17 E-6	0.0270	9500
11	3.17 E-6	0.0301	10500
12	3.36 E-6	0.0334	11500
13	3.36 E-6	0.0368	12500

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0031	1000
2	0.0051	2000
3	0.0071	3000
4	0.0096	4000
5	0.0124	5000
6	0.0154	6000
7	0.0189	7000
8	0.0218	8000
9	0.0254	9000
10	0.0286	10000
11	0.0317	11000
12	0.0351	12000
13	0.0385	13000

TABLE 120  
EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
TEMPERATURE DESICCATED AIR  
SPECIMEN NO. 2-L-12, TENSION-COMPRESSION  
F=12Hz, K2=10, R=0.5,  $U_c = -1.0$ , S=1.5

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.5790	0.0006	3000	1000	5.60 E-7
0.5813	0.0022	5000	2000	1.12 E-6
0.5830	0.0017	7000	2000	8.40 E-7
0.5866	0.0036	9000	2000	1.82 E-6
0.5891	0.0025	11000	2000	1.26 E-6
0.5916	0.0025	13000	2000	1.26 E-6
0.5950	0.0034	15000	2000	1.68 E-6
0.5981	0.0031	17000	2000	1.54 E-6
0.6014	0.0034	19000	2000	1.68 E-6
RUN NO. 2				
0.6020	0.0006	20000	1000	5.60 E-7
0.6048	0.0028	22000	2000	1.40 E-6
0.6070	0.0022	24000	2000	1.12 E-6
0.6093	0.0022	26000	2000	1.12 E-6
0.6118	0.0025	28000	2000	1.26 E-6
0.6138	0.0020	30000	2000	9.80 E-7
0.6160	0.0022	32000	2000	1.12 E-6
0.6182	0.0022	34000	2000	1.12 E-6
0.6208	0.0025	36000	2000	1.26 E-6
RUN NO. 3				
0.6219	0.0011	37000	1000	1.12 E-6
0.6241	0.0022	39000	2000	1.12 E-6
0.6266	0.0025	41000	2000	1.26 E-6
0.6283	0.0017	43000	2000	8.40 E-7
0.6300	0.0017	45000	2000	8.40 E-7
0.6336	0.0036	47000	2000	1.82 E-6
0.6356	0.0020	49000	2000	9.80 E-7
0.6378	0.0022	51000	2000	1.12 E-6
0.6401	0.0022	53000	2000	1.12 E-6



TABLE 120 (continued)

RUN NO. 4

0.6409	0.0008	54000	1000	8.40 E-7
0.6432	0.0022	56000	2000	1.12 E-6
0.6460	0.0028	58000	2000	1.40 E-6
0.6482	0.0022	60000	2000	1.12 E-6
0.6502	0.0020	62000	2000	9.80 E-7
0.6524	0.0022	64000	2000	1.12 E-6
0.6549	0.0025	66000	2000	1.26 E-6
0.6569	0.0020	68000	2000	9.80 E-7
0.6591	0.0022	70000	2000	1.12 E-6

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	7.70 E-7	0.0004	500
2	1.19 E-6	0.0020	2000
3	1.16 E-6	0.0043	4000
4	1.23 E-6	0.0067	6000
5	1.09 E-6	0.0090	8000
6	1.30 E-6	0.0114	10000
7	1.26 E-6	0.0139	12000
8	1.19 E-6	0.0164	14000
9	1.29 E-6	0.0189	16000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0008	1000
2	0.0032	3000
3	0.0055	5000
4	0.0079	7000
5	0.0101	9000
6	0.0127	11000
7	0.0152	13000
8	0.0176	15000
9	0.0202	17000

TABLE 121

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 5-L-2, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.5$ ,  $U_c=-2$ ,  $S=1.5$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.0713	0.0014	45000	1000	1.40 E-6
1.0732	0.0020	47000	2000	9.80 E-7
1.0755	0.0022	49000	2000	1.12 E-6
1.0783	0.0028	51000	2000	1.40 E-6
1.0814	0.0031	53000	2000	1.54 E-6
1.0836	0.0022	55000	2000	1.12 E-6
1.0864	0.0028	57000	2000	1.40 E-6
1.0889	0.0025	59000	2000	1.26 E-6
1.0914	0.0025	61000	2000	1.26 E-6
1.0945	0.0031	63000	2000	1.54 E-6
1.0970	0.0025	65000	2000	1.26 E-6
RUN NO. 2				
1.0979	0.0008	66000	1000	8.40 E-7
1.0993	0.0014	68000	2000	7.00 E-7
1.1015	0.0022	70000	2000	1.12 E-6
1.1049	0.0034	72000	2000	1.68 E-6
1.1080	0.0031	74000	2000	1.54 E-6
1.1110	0.0031	76000	2000	1.54 E-6
1.1133	0.0022	78000	2000	1.12 E-6
1.1169	0.0036	80000	2000	1.82 E-6
1.1197	0.0028	82000	2000	1.40 E-6
1.1228	0.0031	84000	2000	1.54 E-6
1.1262	0.0034	86000	2000	1.68 E-6
RUN NO. 3				
1.1273	0.0011	87000	1000	1.12 E-6
1.1295	0.0022	89000	2000	1.12 E-6
1.1315	0.0020	91000	2000	9.80 E-7
1.1340	0.0025	93000	2000	1.26 E-6
1.1371	0.0031	95000	2000	1.54 E-6
1.1402	0.0031	97000	2000	1.54 E-6
1.1430	0.0028	99000	2000	1.40 E-6
1.1455	0.0025	101000	2000	1.26 E-6
1.1491	0.0036	103000	2000	1.82 E-6
1.1519	0.0028	105000	2000	1.40 E-6
1.1547	0.0028	107000	2000	1.40 E-6

TABLE 121 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	1.12 E-6	0.0006	500
2	9.33 E-7	0.0021	2000
3	1.07 E-6	0.0041	4000
4	1.45 E-6	0.0066	6000
5	1.54 E-6	0.0096	8000
6	1.40 E-6	0.0125	10000
7	1.31 E-6	0.0152	12000
8	1.45 E-6	0.0180	14000
9	1.49 E-6	0.0209	16000
10	1.49 E-6	0.0239	18000
11	1.45 E-6	0.0268	20000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0011	1000
2	0.0030	3000
3	0.0051	5000
4	0.0080	7000
5	0.0111	9000
6	0.0139	11000
7	0.0165	13000
8	0.0194	15000
9	0.0224	17000
10	0.0254	19000
11	0.0283	21000

TABLE 122

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN 2-L-7, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K2=10$ ,  $R=0.1$ ,  $U_c = -1.0$ ,  $S=2.0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.9369	0.0050	23000	1000	5.04 E-6
0.9402	0.0034	25000	2000	1.68 E-6
0.9436	0.0034	27000	2000	1.68 E-6
0.9486	0.0050	29000	2000	2.52 E-6
0.9520	0.0034	30000	1000	3.36 E-6
0.9559	0.0039	31000	1000	3.92 E-6
0.9604	0.0045	32000	1000	4.48 E-6
0.9654	0.0050	33000	1000	5.04 E-6
0.9694	0.0039	34000	1000	3.92 E-6
0.9738	0.0045	35000	1000	4.48 E-6
0.9789	0.0050	36000	1000	5.04 E-6
0.9839	0.0050	37000	1000	5.04 E-6
0.9890	0.0050	38000	1000	5.04 E-6
RUN NO. 2				
0.9934	0.0045	39000	1000	4.48 E-6
0.9968	0.0034	41000	2000	1.68 E-6
1.0007	0.0039	43000	2000	1.96 E-6
1.0052	0.0045	45000	2000	2.24 E-6
1.0091	0.0039	46000	1000	3.92 E-6
1.0125	0.0034	47000	1000	3.36 E-6
1.0170	0.0045	48000	1000	4.48 E-6
1.0220	0.0050	49000	1000	5.04 E-6
1.0259	0.0039	50000	1000	3.92 E-6
1.0310	0.0050	51000	1000	5.04 E-6
1.0349	0.0039	52000	1000	3.92 E-6
1.0410	0.0062	53000	1000	6.16 E-6
1.0455	0.0045	54000	1000	4.48 E-6
RUN NO. 3				
1.0500	0.0045	55000	1000	4.48 E-6
1.0534	0.0034	57000	2000	1.68 E-6
1.0567	0.0034	59000	2000	1.68 E-6
1.0623	0.0056	61000	2000	2.80 E-6
1.0668	0.0045	62000	1000	4.48 E-6
1.0702	0.0034	63000	1000	3.36 E-6
1.0735	0.0034	64000	1000	3.36 E-6
1.0769	0.0034	65000	1000	3.36 E-6
1.0825	0.0056	66000	1000	5.60 E-6
1.0870	0.0045	67000	1000	4.48 E-6
1.0914	0.0045	68000	1000	4.48 E-6
1.0965	0.0050	69000	1000	5.04 E-6
1.1026	0.0062	(279) 70000	1000	6.16 E-6

TABLE 122 (continued)

RUN NO. 4

1.1116	0.0034	72000	1000	3.36 E-6
1.1138	0.0022	74000	2000	1.12 E-6
1.1172	0.0034	76000	2000	1.68 E-6
1.1217	0.0045	78000	2000	2.24 E-6
1.1250	0.0034	79000	1000	3.36 E-6
1.1284	0.0034	80000	1000	3.36 E-6
1.1318	0.0034	81000	1000	3.36 E-6
1.1351	0.0034	82000	1000	3.36 E-6
1.1396	0.0045	83000	1000	4.48 E-6
1.1441	0.0045	84000	1000	4.48 E-6
1.1497	0.0056	85000	1000	5.60 E-6
1.1542	0.0045	86000	1000	4.48 E-6
1.1586	0.0045	87000	1000	4.48 E-6

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	4.34 E-6	0.0022	500
2	1.54 E-6	0.0059	2000
3	1.75 E-6	0.0092	4000
4	2.45 E-6	0.0134	6000
5	3.78 E-6	0.0177	7500
6	3.50 E-6	0.0214	8500
7	3.92 E-6	0.0251	9500
8	4.20 E-6	0.0291	10500
9	4.48 E-6	0.0335	11500
10	4.62 E-6	0.0380	12500
11	4.76 E-6	0.0427	13500
12	5.18 E-6	0.0477	14500
13	5.04 E-6	0.0528	15500

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0043	1000
2	0.0074	3000
3	0.0109	5000
4	0.0158	7000
5	0.0196	8000
6	0.0231	9000
7	0.0270	10000
8	0.0312	11000
9	0.0357	12000
10	0.0403	13000
11	0.0451	14000
12	0.0503	15000
13	0.0553	(280) 16000

TABLE 123

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN 2-L-7, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K2=10$ ,  $R=0.1$ ,  $U_c = -2.0$ ,  $S=2$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.2090	0.0045	6000	1000	4.48 E-6
1.2113	0.0022	8000	2000	1.12 E-6
1.2130	0.0017	10000	2000	8.40 E-7
1.2163	0.0034	12000	2000	1.68 E-6
1.2186	0.0022	13000	1000	2.24 E-6
1.2214	0.0028	14000	1000	2.80 E-6
1.2242	0.0028	15000	1000	2.80 E-6
1.2275	0.0034	16000	1000	3.36 E-6
1.2314	0.0039	17000	1000	3.92 E-6
1.2354	0.0039	18000	1000	3.92 E-6
1.2398	0.0045	19000	1000	4.48 E-6
1.2449	0.0050	20000	1000	5.04 E-6
1.2494	0.0045	21000	1000	4.48 E-6
1.2572	0.0078	22000	1000	7.84 E-6
1.2611	0.0039	23000	1000	3.92 E-6
1.2662	0.0050	24000	1000	5.04 E-6
1.2712	0.0050	25000	1000	5.04 E-6
RUN NO. 2				
1.2768	0.0056	26000	1000	5.60 E-6
1.2790	0.0022	28000	2000	1.12 E-6
1.2818	0.0028	30000	2000	1.40 E-6
1.2841	0.0022	32000	2000	1.12 E-6
1.2863	0.0022	33000	1000	2.24 E-6
1.2897	0.0034	34000	1000	3.36 E-6
1.2930	0.0034	35000	1000	3.36 E-6
1.2964	0.0034	36000	1000	3.36 E-6
1.3003	0.0039	37000	1000	3.92 E-6
1.3054	0.0050	38000	1000	5.04 E-6
1.3098	0.0045	39000	1000	4.48 E-6
1.3143	0.0045	40000	1000	4.48 E-6
1.3199	0.0056	41000	1000	5.60 E-6
1.3233	0.0034	42000	1000	3.36 E-6
1.3289	0.0056	43000	1000	5.60 E-6
1.3334	0.0045	44000	1000	4.48 E-6
1.3390	0.0056	45000	1000	5.60 E-6

TABLE 123 (continued)

## RUN NO. 3

1.3423	0.0034	46000	1000	3.36 E-6
1.3451	0.0028	48000	2000	1.40 E-6
1.3485	0.0034	50000	2000	1.68 E-6
1.3524	0.0039	52000	2000	1.96 E-6
1.3546	0.0022	53000	1000	2.24 E-6
1.3586	0.0039	54000	1000	3.92 E-6
1.3619	0.0034	55000	1000	3.36 E-6
1.3670	0.0050	56000	1000	5.04 E-6
1.3714	0.0045	57000	1000	4.48 E-6
1.3754	0.0039	58000	1000	3.92 E-6
1.3798	0.0045	59000	1000	4.48 E-6
1.3843	0.0045	60000	1000	4.48 E-6
1.3888	0.0045	61000	1000	4.48 E-6
1.3938	0.0050	62000	1000	5.04 E-6
1.3989	0.0050	63000	1000	5.04 E-6
1.4039	0.0050	64000	1000	5.04 E-6
1.4084	0.0045	65000	1000	4.48 E-6

## RUN NO. 4

1.4123	0.0039	66000	1000	3.92 E-6
1.4146	0.0022	68000	2000	1.12 E-6
1.4168	0.0022	70000	2000	1.12 E-6
1.4202	0.0034	72000	2000	1.68 E-6
1.4224	0.0022	73000	1000	2.24 E-6
1.4246	0.0022	74000	1000	2.24 E-6
1.4291	0.0045	75000	1000	4.48 E-6
1.4319	0.0028	76000	1000	2.80 E-6
1.4358	0.0039	77000	1000	3.92 E-6
1.4403	0.0045	78000	1000	4.48 E-6
1.4442	0.0039	79000	1000	3.92 E-6
1.4493	0.0050	80000	1000	5.04 E-6
1.4538	0.0045	81000	1000	4.48 E-6
1.4582	0.0045	82000	1000	4.48 E-6
1.4633	0.0050	83000	1000	5.04 E-6
1.4683	0.0050	84000	1000	5.04 E-6
1.4739	0.0056	85000	1000	5.60 E-6

TABLE 123 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	4.34 E-6	0.0022	500
2	1.19 E-6	0.0055	2000
3	1.26 E-6	0.0080	4000
4	1.61 E-6	0.0109	6000
5	2.24 E-6	0.0136	7500
6	3.08 E-6	0.0162	8500
7	3.50 E-6	0.0195	9500
8	3.64 E-6	0.0231	10500
9	4.06 E-6	0.0270	11500
10	4.34 E-6	0.0312	12500
11	4.34 E-6	0.0355	13500
12	4.76 E-6	0.0400	14500
13	4.76 E-6	0.0448	15500
14	5.18 E-6	0.0498	16500
15	4.90 E-6	0.0548	17500
16	4.90 E-6	0.0597	18500
17	5.18 E-6	0.0648	19500

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0043	1000
2	0.0067	3000
3	0.0092	5000
4	0.0125	7000
5	0.0147	8000
6	0.0178	9000
7	0.0213	10000
8	0.0249	11000
9	0.0290	12000
10	0.0333	13000
11	0.0377	14000
12	0.0424	15000
13	0.0472	16000
14	0.0524	17000
15	0.0573	18000
16	0.0622	19000
17	0.0673	20000



TABLE 124

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 3-L-3, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K2=10$ ,  $R=0.3$ ,  $U_c = -1.0$ ,  $S=2.0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.5505	0.0028	19000	1000	2.80 E-6
0.5572	0.0067	23000	4000	1.68 E-6
0.5673	0.0101	27000	4000	2.52 E-6
0.5723	0.0050	29000	2000	2.52 E-6
0.5796	0.0073	31000	2000	3.64 E-6
0.5852	0.0056	33000	2000	2.80 E-6
0.5908	0.0056	35000	2000	2.80 E-6
0.5964	0.0056	37000	2000	2.80 E-6
0.6042	0.0078	39000	2000	3.92 E-6
0.6104	0.0062	41000	2000	3.08 E-6
0.6177	0.0073	43000	2000	3.64 E-6
0.6244	0.0067	45000	2000	3.36 E-6
0.6311	0.0067	47000	2000	3.36 E-6
0.6373	0.0062	49000	2000	3.08 E-6
0.6434	0.0062	51000	2000	3.08 E-6
0.6502	0.0067	53000	2000	3.36 E-6
0.6563	0.0062	55000	2000	3.08 E-6
RUN NO. 2				
0.6591	0.0028	56000	1000	2.80 E-6
0.6664	0.0073	60000	4000	1.82 E-6
0.6759	0.0095	64000	4000	2.38 E-6
0.6821	0.0062	66000	2000	3.08 E-6
0.6882	0.0062	68000	2000	3.08 E-6
0.6944	0.0062	70000	2000	3.08 E-6
0.7017	0.0073	72000	2000	3.64 E-6
0.7090	0.0073	74000	2000	3.64 E-6
0.7146	0.0056	76000	2000	2.80 E-6
0.7224	0.0078	78000	2000	3.92 E-6
0.7286	0.0062	80000	2000	3.08 E-6
0.7358	0.0073	82000	2000	3.64 E-6
0.7437	0.0078	84000	2000	3.92 E-6
0.7498	0.0062	86000	2000	3.08 E-6
0.7560	0.0062	88000	2000	3.08 E-6
0.7627	0.0067	90000	2000	3.36 E-6
0.7694	0.0067	92000	2000	3.36 E-6

TABLE 124 (continued)

RUN NO. 3

0.7756	0.0028	93500	1000	2.80 E-6
0.7818	0.0062	97500	4000	1.54 E-6
0.7930	0.0112	101500	4000	2.80 E-6
0.7997	0.0067	103500	2000	3.36 E-6
0.8058	0.0062	105500	2000	3.08 E-6
0.8131	0.0073	107500	2000	3.64 E-6
0.8198	0.0067	109500	2000	3.36 E-6
0.8266	0.0067	111500	2000	3.36 E-6
0.8338	0.0073	113500	2000	3.64 E-6
0.8394	0.0056	115500	2000	2.80 E-6
0.8456	0.0062	117500	2000	3.08 E-6
0.8529	0.0073	119500	2000	3.64 E-6
0.8602	0.0073	121500	2000	3.64 E-6
0.8669	0.0067	123500	2000	3.36 E-6
0.8730	0.0062	125500	2000	3.08 E-6
0.8792	0.0062	127500	2000	3.08 E-6
0.8854	0.0062	129500	2000	3.08 E-6

TABLE 124 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	2.80 E-6	0.0014	500
2	1.68 E-6	0.0062	3000
3	2.57 E-6	0.0147	7000
4	2.99 E-6	0.0228	10000
5	3.27 E-6	0.0290	12000
6	3.17 E-6	0.0355	14000
7	3.27 E-6	0.0419	16000
8	3.27 E-6	0.0484	18000
9	3.45 E-6	0.0552	20000
10	3.27 E-6	0.0619	22000
11	3.27 E-6	0.0684	24000
12	3.55 E-6	0.0752	26000
13	3.64 E-6	0.0824	28000
14	3.17 E-6	0.0892	30000
15	3.08 E-6	0.0955	32000
16	3.27 E-6	0.1018	34000
17	3.17 E-6	0.1083	36000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0028	1000
2	0.0095	5000
3	0.0198	9000
4	0.0258	11000
5	0.0323	13000
6	0.0386	15000
7	0.0452	17000
8	0.0517	19000
9	0.0586	21000
10	0.0651	23000
11	0.0717	25000
12	0.0788	27000
13	0.0861	29000
14	0.0924	31000
15	0.0986	33000
16	0.1051	35000
17	0.1114	37000

TABLE 125

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 5-L-17, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K2=10$ ,  $R=0.3$ ,  $U_c = -2$   $S=2.0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.9990	0.0017	2000	1000	1.68 E-6
1.0021	0.0031	4000	2000	1.54 E-6
1.0030	0.0008	6000	2000	4.20 E-7
1.0052	0.0022	8000	2000	1.12 E-6
1.0074	0.0022	10000	2000	1.12 E-6
1.0105	0.0031	12000	2000	1.54 E-6
1.0153	0.0048	14000	2000	2.38 E-6
1.0209	0.0056	16000	2000	2.80 E-6
1.0268	0.0059	18000	2000	2.94 E-6
1.0324	0.0056	20000	2000	2.80 E-6
1.0394	0.0070	22000	2000	3.50 E-6
1.0461	0.0067	24000	2000	3.36 E-6
1.0522	0.0062	26000	2000	3.08 E-6
1.0581	0.0059	28000	2000	2.94 E-6
1.0648	0.0067	30000	2000	3.36 E-6
1.0716	0.0067	32000	2000	3.36 E-6
1.0774	0.0059	34000	2000	2.94 E-6
1.0842	0.0067	36000	2000	3.36 E-6
RUN NO. 2				
1.0861	0.0020	37000	1000	1.96 E-6
1.0889	0.0028	39000	2000	1.40 E-6
1.0903	0.0014	41000	2000	7.00 E-7
1.0931	0.0028	43000	2000	1.40 E-6
1.0968	0.0036	45000	2000	1.82 E-6
1.1018	0.0050	47000	2000	2.52 E-6
1.1077	0.0059	49000	2000	2.94 E-6
1.1147	0.0070	51000	2000	3.50 E-6
1.1206	0.0059	53000	2000	2.94 E-6
1.1281	0.0076	55000	2000	3.78 E-6
1.1346	0.0064	57000	2000	3.22 E-6
1.1418	0.0073	59000	2000	3.64 E-6
1.1488	0.0070	61000	2000	3.50 E-6
1.1558	0.0070	63000	2000	3.50 E-6
1.1617	0.0059	65000	2000	2.94 E-6
1.1687	0.0070	67000	2000	3.50 E-6
1.1749	0.0062	69000	2000	3.08 E-6
1.1824	0.0076	71000	2000	3.78 E-6

TABLE 125 (continued)

## RUN NO. 3

1.1850	0.0025	72000	1000	2.52 E-6
1.1864	0.0014	74000	2000	7.00 E-7
1.1886	0.0022	76000	2000	1.12 E-6
1.1911	0.0025	78000	2000	1.26 E-6
1.1956	0.0045	80000	2000	2.24 E-6
1.2018	0.0062	82000	2000	3.08 E-6
1.2074	0.0056	84000	2000	2.80 E-6
1.2141	0.0067	86000	2000	3.36 E-6
1.2194	0.0053	88000	2000	2.66 E-6
1.2253	0.0059	90000	2000	2.94 E-6
1.2320	0.0067	92000	2000	3.36 E-6
1.2384	0.0064	94000	2000	3.22 E-6
1.2446	0.0062	96000	2000	3.08 E-6
1.2505	0.0059	98000	2000	2.94 E-6
1.2572	0.0067	100000	2000	3.36 E-6
1.2645	0.0073	102000	2000	3.64 E-6
1.2706	0.0062	104000	2000	3.08 E-6
1.2771	0.0064	106000	2000	3.22 E-6

## RUN NO. 4

1.3633	0.0031	142000	1000	3.08 E-6
1.3650	0.0017	144000	2000	8.40 E-7
1.3678	0.0028	146000	2000	1.40 E-6
1.3700	0.0022	148000	2000	1.12 E-6
1.3740	0.0039	150000	2000	1.96 E-6
1.3784	0.0045	152000	2000	2.24 E-6
1.3835	0.0050	154000	2000	2.52 E-6
1.3905	0.0070	156000	2000	3.50 E-6
1.3975	0.0070	158000	2000	3.50 E-6
1.4039	0.0064	160000	2000	3.22 E-6
1.4104	0.0064	162000	2000	3.22 E-6
1.4168	0.0064	164000	2000	3.22 E-6
1.4232	0.0064	166000	2000	3.22 E-6
1.4305	0.0073	168000	2000	3.64 E-6
1.4370	0.0064	170000	2000	3.22 E-6
1.4437	0.0067	172000	2000	3.36 E-6
1.4498	0.0062	174000	2000	3.08 E-6
1.4563	0.0064	176000	2000	3.22 E-6

TABLE 125 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	2.31 E-6	0.0012	500
2	1.12 E-6	0.0034	2000
3	9.10 E-7	0.0055	4000
4	1.22 E-6	0.0076	6000
5	1.79 E-6	0.0106	8000
6	2.35 E-6	0.0147	10000
7	2.66 E-6	0.0197	12000
8	3.29 E-6	0.0257	14000
9	3.01 E-6	0.0320	16000
10	3.19 E-6	0.0382	18000
11	3.33 E-6	0.0447	20000
12	3.36 E-6	0.0514	22000
13	3.22 E-6	0.0580	24000
14	3.25 E-6	0.0644	26000
15	3.22 E-6	0.0709	28000
16	3.46 E-6	0.0776	30000
17	3.05 E-6	0.0841	32000
18	3.39 E-6	0.0905	34000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0023	1000
2	0.0046	3000
3	0.0064	5000
4	0.0088	7000
5	0.0124	9000
6	0.0171	11000
7	0.0224	13000
8	0.0290	15000
9	0.0350	17000
10	0.0414	19000
11	0.0480	21000
12	0.0547	23000
13	0.0612	25000
14	0.0677	27000
15	0.0741	29000
16	0.0811	31000
17	0.0872	33000
18	0.0939	35000

TABLE 126

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 1-L-19, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K2=10$ ,  $R=0.5$ ,  $U_c = -1$ ,  $S=2.0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.4648	0.0028	18500	1000	2.80 E-6
0.4676	0.0028	22500	4000	7.00 E-7
0.4682	0.0006	24500	2000	2.80 E-7
0.4704	0.0022	26500	2000	1.12 E-6
0.4732	0.0028	28500	2000	1.40 E-6
0.4760	0.0028	30500	2000	1.40 E-6
0.4788	0.0028	32500	2000	1.40 E-6
0.4816	0.0028	34500	2000	1.40 E-6
0.4844	0.0028	36500	2000	1.40 E-6
0.4878	0.0034	38500	2000	1.68 E-6
0.4906	0.0028	40500	2000	1.40 E-6
RUN NO. 2				
0.4922	0.0017	41500	1000	1.68 E-6
0.4945	0.0022	45500	4000	5.60 E-7
0.4973	0.0028	47500	2000	1.40 E-6
0.4990	0.0017	49500	2000	8.40 E-7
0.5006	0.0017	51500	2000	8.40 E-7
0.5034	0.0028	53500	2000	1.40 E-6
0.5057	0.0022	55500	2000	1.12 E-6
0.5079	0.0022	57500	2000	1.12 E-6
0.5118	0.0039	59500	2000	1.96 E-6
0.5146	0.0028	61500	2000	1.40 E-6
0.5163	0.0017	63500	2000	8.40 E-7
RUN NO. 3				
0.5180	0.0017	64500	1000	1.68 E-6
0.5208	0.0028	68500	4000	7.00 E-7
0.5225	0.0017	70500	2000	8.40 E-7
0.5253	0.0028	72500	2000	1.40 E-6
0.5270	0.0017	74500	2000	8.40 E-7
0.5298	0.0028	76500	2000	1.40 E-6
0.5326	0.0028	78500	2000	1.40 E-6
0.5359	0.0034	80500	2000	1.68 E-6
0.5387	0.0028	82500	2000	1.40 E-6
0.5410	0.0022	84500	2000	1.12 E-6
0.5443	0.0034	86500	2000	1.68 E-6

TABLE 126 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	2.05 E-6	0.0010	500
2	6.53 E-7	0.0034	3000
3	8.40 E-7	0.0055	6000
4	1.12 E-6	0.0075	8000
5	1.03 E-6	0.0096	10000
6	1.40 E-6	0.0120	12000
7	1.31 E-6	0.0147	14000
8	1.40 E-6	0.0175	16000
9	1.59 E-6	0.0204	18000
10	1.40 E-6	0.0234	20000
11	1.31 E-6	0.0261	22000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0021	1000
2	0.0047	5000
3	0.0063	7000
4	0.0086	9000
5	0.0106	11000
6	0.0134	13000
7	0.0161	15000
8	0.0189	17000
9	0.0220	19000
10	0.0248	21000
11	0.0274	23000



TABLE 127

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 3-L-18, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K2=10$ ,  $R=0.5$ ,  $U_c = -2$ ,  $S=2.0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.5079	0.0017	5000	1000	1.68 E-6
0.5096	0.0017	9000	4000	4.20 E-7
0.5110	0.0014	11000	2000	7.00 E-7
0.5118	0.0008	13000	2000	4.20 E-7
0.5149	0.0031	15000	2000	1.54 E-6
0.5160	0.0011	17000	2000	5.60 E-7
0.5186	0.0025	19000	2000	1.26 E-6
0.5208	0.0022	21000	2000	1.12 E-6
0.5233	0.0025	23000	2000	1.26 E-6
0.5256	0.0022	25000	2000	1.12 E-6
RUN NO. 2				
0.5275	0.0020	26000	1000	1.96 E-6
0.5300	0.0025	30000	4000	6.30 E-7
0.5312	0.0011	32000	2000	5.60 E-7
0.5328	0.0017	34000	2000	8.40 E-7
0.5342	0.0014	36000	2000	7.00 E-7
0.5356	0.0014	38000	2000	7.00 E-7
0.5370	0.0014	40000	2000	7.00 E-7
0.5401	0.0031	42000	2000	1.54 E-6
0.5429	0.0028	44000	2000	1.40 E-6
0.5457	0.0026	46000	2000	1.40 E-6
RUN NO. 3				
0.5508	0.0028	49000	1000	2.80 E-6
0.5527	0.0020	53000	4000	4.90 E-7
0.5538	0.0011	55000	2000	5.60 E-7
0.5547	0.0008	57000	2000	4.20 E-7
0.5561	0.0014	59000	2000	7.00 E-7
0.5575	0.0014	61000	2000	7.00 E-7
0.5603	0.0028	63000	2000	1.40 E-6
0.5622	0.0020	65000	2000	9.80 E-7
0.5650	0.0028	67000	2000	1.40 E-6
0.5678	0.0028	69000	2000	1.40 E-6

TABLE 127 (continued)

RUN NO. 4

0.5734	0.0011	72000	1000	1.12 E-6
0.5757	0.0022	76000	4000	5.60 E-7
0.5765	0.0008	78000	2000	4.20 E-7
0.5779	0.0014	80000	2000	7.00 E-7
0.5788	0.0008	82000	2000	4.20 E-7
0.5802	0.0014	84000	2000	7.00 E-7
0.5821	0.0020	86000	2000	9.80 E-7
0.5846	0.0025	88000	2000	1.26 E-6
0.5863	0.0017	90000	2000	8.40 E-7
0.5888	0.0025	92000	2000	1.26 E-6

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	1.89 E-6	0.0009	500
2	5.25 E-7	0.0029	3000
3	5.60 E-7	0.0045	6000
4	5.95 E-7	0.0057	8000
5	8.40 E-7	0.0071	10000
6	6.65 E-7	0.0086	12000
7	1.09 E-6	0.0104	14000
8	1.22 E-6	0.0127	16000
9	1.22 E-6	0.0152	18000
10	1.30 E-6	0.0177	20000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0019	1000
2	0.0040	5000
3	0.0051	7000
4	0.0063	9000
5	0.0080	11000
6	0.0093	13000
7	0.0115	15000
8	0.0139	17000
9	0.0164	19000
10	0.0190	21000

TABLE 128

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 4-L-14, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K2=10$ ,  $R=0.1$ ,  $U_c = -1.0$ ,  $S=2.5$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.0069	0.0045	3000	1000	4.48 E-6
1.0125	0.0056	11000	8000	7.00 E-7
1.0265	0.0140	19000	8000	1.75 E-6
1.0377	0.0112	23000	4000	2.80 E-6
1.0444	0.0067	25000	2000	3.36 E-6
1.0489	0.0045	27000	2000	2.24 E-6
1.0578	0.0090	29000	2000	4.48 E-6
1.0657	0.0078	31000	2000	3.92 E-6
1.0730	0.0073	33000	2000	3.64 E-6
1.0808	0.0078	35000	2000	3.92 E-6
1.0886	0.0078	37000	2000	3.92 E-6
1.0959	0.0073	39000	2000	3.64 E-6
1.1038	0.0078	41000	2000	3.92 E-6
1.1105	0.0067	43000	2000	3.36 E-6
1.1172	0.0067	45000	2000	3.36 E-6
1.1245	0.0073	47000	2000	3.64 E-6
1.1329	0.0084	49000	2000	4.20 E-6
1.1407	0.0078	51000	2000	3.92 E-6
1.1491	0.0084	53000	2000	4.20 E-6
1.1564	0.0073	55000	2000	3.64 E-6
RUN NO. 2				
1.2348	0.0045	74000	1000	4.48 E-6
1.2415	0.0067	82000	8000	8.40 E-7
1.2550	0.0134	90000	8000	1.68 E-6
1.2650	0.0101	94000	4000	2.52 E-6
1.2701	0.0050	96000	2000	2.52 E-6
1.2762	0.0062	98000	2000	3.08 E-6
1.2852	0.0090	100000	2000	4.48 E-6
1.2908	0.0056	102000	2000	2.80 E-6
1.3003	0.0095	104000	2000	4.76 E-6
1.3087	0.0084	106000	2000	4.20 E-6
1.3160	0.0073	108000	2000	3.64 E-6
1.3238	0.0078	110000	2000	3.92 E-6
1.3317	0.0078	112000	2000	3.92 E-6
1.3395	0.0078	114000	2000	3.92 E-6
1.3479	0.0084	116000	2000	4.20 E-6
1.3563	0.0084	118000	2000	4.20 E-6
1.3630	0.0067	120000	2000	3.36 E-6
1.3714	0.0084	122000	2000	4.20 E-6
1.3787	0.0073	124000	2000	3.64 E-6
1.3871	0.0084	126000	2000	4.20 E-6

TABLE 128 (continued)

RUN NO. 3

1.4655	0.0039	145000	1000	3.92 E-6
1.4734	0.0078	153000	8000	9.80 E-7
1.4874	0.0140	161000	8000	1.75 E-6
1.4974	0.0101	165000	4000	2.52 E-6
1.5036	0.0062	167000	2000	3.08 E-6
1.5109	0.0073	169000	2000	3.64 E-6
1.5176	0.0067	171000	2000	3.36 E-6
1.5243	0.0067	173000	2000	3.36 E-6
1.5316	0.0073	175000	2000	3.64 E-6
1.5394	0.0078	177000	2000	3.92 E-6
1.5473	0.0078	179000	2000	3.92 E-6
1.5562	0.0090	181000	2000	4.48 E-6
1.5646	0.0084	183000	2000	4.20 E-6
1.5736	0.0090	185000	2000	4.48 E-6
1.5809	0.0073	187000	2000	3.64 E-6
1.5882	0.0073	189000	2000	3.64 E-6
1.5966	0.0084	191000	2000	4.20 E-6
1.6033	0.0067	193000	2000	3.36 E-6
1.6111	0.0078	195000	2000	3.92 E-6
1.6195	0.0084	197000	2000	4.20 E-6

TABLE 128 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	4.29 E-6	0.0021	500
2	8.40 E-7	0.0077	5000
3	1.73 E-6	0.0179	13000
4	2.61 E-6	0.0301	19000
5	2.99 E-6	0.0383	22000
6	2.99 E-6	0.0443	24000
7	4.11 E-6	0.0514	26000
8	3.36 E-6	0.0588	28000
9	4.01 E-6	0.0662	30000
10	4.01 E-6	0.0742	32000
11	3.83 E-6	0.0820	34000
12	4.01 E-6	0.0899	36000
13	4.01 E-6	0.0979	38000
14	3.92 E-6	0.1059	40000
15	3.73 E-6	0.1135	42000
16	3.83 E-6	0.1211	44000
17	3.92 E-6	0.1288	46000
18	3.83 E-6	0.1366	48000
19	3.92 E-6	0.1443	50000
20	4.01 E-6	0.1522	52000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0043	1000
2	0.0110	9000
3	0.0248	17000
4	0.0353	21000
5	0.0413	23000
6	0.0473	25000
7	0.0555	27000
8	0.0622	29000
9	0.0702	31000
10	0.0782	33000
11	0.0859	35000
12	0.0939	37000
13	0.1019	39000
14	0.1098	41000
15	0.1173	43000
16	0.1249	45000
17	0.1328	47000
18	0.1404	49000
19	0.1482	51000
20	0.1563	53000

TABLE 129

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 6-1-13, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K2=10$ ,  $R=0.1$ ,  $U_c = -2$ ,  $S=2.5$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.7504	0.0062	18000	2000	3.08 E-6
0.7549	0.0045	22000	4000	1.12 E-6
0.7588	0.0039	26000	4000	9.80 E-7
0.7633	0.0045	30000	4000	1.12 E-6
0.7678	0.0045	32000	2000	2.24 E-6
0.7717	0.0039	34000	2000	1.96 E-6
0.7762	0.0045	36000	2000	2.24 E-6
0.7812	0.0050	38000	2000	2.52 E-6
0.7879	0.0067	40000	2000	3.36 E-6
0.7941	0.0062	42000	2000	3.08 E-6
0.8025	0.0084	44000	2000	4.20 E-6
0.8114	0.0090	46000	2000	4.48 E-6
0.8198	0.0084	48000	2000	4.20 E-6
0.8288	0.0090	50000	2000	4.48 E-6
RUN NO. 2				
0.8344	0.0056	52000	2000	2.80 E-6
0.8378	0.0034	56000	4000	8.40 E-7
0.8400	0.0022	60000	4000	5.60 E-7
0.8450	0.0050	64000	4000	1.26 E-6
0.8467	0.0017	66000	2000	8.40 E-7
0.8501	0.0034	68000	2000	1.68 E-6
0.8546	0.0045	70000	2000	2.24 E-6
0.8585	0.0039	72000	2000	1.96 E-6
0.8634	0.0049	74000	2000	2.47 E-6
0.8680	0.0046	76000	2000	2.29 E-6
0.8742	0.0062	78000	2000	3.08 E-6
0.8814	0.0073	80000	2000	3.64 E-6
0.8882	0.0067	82000	2000	3.36 E-6
0.8954	0.0073	84000	2000	3.64 E-6

TABLE 129 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	2.94 E-6	0.0029	1000
2	9.80 E-7	0.0078	4000
3	7.70 E-7	0.0113	8000
4	1.19 E-6	0.0153	12000
5	1.54 E-6	0.0192	15000
6	1.82 E-6	0.0225	17000
7	2.24 E-6	0.0266	19000
8	2.24 E-6	0.0311	21000
9	2.92 E-6	0.0362	23000
10	2.68 E-6	0.0418	25000
11	3.64 E-6	0.0482	27000
12	4.06 E-6	0.0559	29000
13	3.78 E-6	0.0637	31000
14	4.06 E-6	0.0715	33000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0059	2000
2	0.0098	6000
3	0.0129	10000
4	0.0176	14000
5	0.0207	16000
6	0.0244	18000
7	0.0288	20000
8	0.0333	22000
9	0.0392	24000
10	0.0445	26000
11	0.0518	28000
12	0.0599	30000
13	0.0675	32000
14	0.0756	34000

TABLE 130

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 1-L-19, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K2=10$ ,  $R=0.3$ ,  $U_c = -1.0$ ,  $S=2.5$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.5510	0.0017	3000	1000	1.68 E-6
0.5544	0.0034	7000	4000	8.40 E-7
0.5572	0.0028	11000	4000	7.00 E-7
0.5628	0.0056	15000	4000	1.40 E-6
0.5656	0.0028	17000	2000	1.40 E-6
0.5701	0.0045	19000	2000	2.24 E-6
0.5751	0.0050	21000	2000	2.52 E-6
0.5802	0.0050	23000	2000	2.52 E-6
0.5860	0.0059	25000	2000	2.94 E-6
0.5914	0.0053	27000	2000	2.66 E-6
0.5981	0.0067	29000	2000	3.36 E-6
0.6042	0.0062	31000	2000	3.08 E-6
0.6107	0.0064	33000	2000	3.22 E-6
0.6166	0.0059	35000	2000	2.94 E-6
0.6238	0.0073	37000	2000	3.64 E-6
RUN NO. 2				
0.6594	0.0036	48000	1000	3.64 E-6
0.6628	0.0034	52000	4000	8.40 E-7
0.6678	0.0050	56000	4000	1.26 E-6
0.6748	0.0070	60000	4000	1.75 E-6
0.6798	0.0050	62000	2000	2.52 E-6
0.6838	0.0039	64000	2000	1.96 E-6
0.6891	0.0053	66000	2000	2.66 E-6
0.6947	0.0056	68000	2000	2.80 E-6
0.7008	0.0062	70000	2000	3.08 E-6
0.7062	0.0053	72000	2000	2.66 E-6
0.7129	0.0067	74000	2000	3.36 E-6
0.7202	0.0073	76000	2000	3.64 E-6
0.7269	0.0067	78000	2000	3.36 E-6
0.7342	0.0073	80000	2000	3.64 E-6
0.7409	0.0067	82000	2000	3.36 E-6



TABLE 130 (continued)

RUN NO. 3

0.7440	0.0031	83000	1000	3.08 E-6
0.7476	0.0036	87000	4000	9.10 E-7
0.7532	0.0056	91000	4000	1.40 E-6
0.7582	0.0050	95000	4000	1.26 E-6
0.7627	0.0045	97000	2000	2.24 E-6
0.7661	0.0034	99000	2000	1.68 E-6
0.7722	0.0062	101000	2000	3.08 E-6
0.7776	0.0053	103000	2000	2.66 E-6
0.7834	0.0059	105000	2000	2.94 E-6
0.7893	0.0059	107000	2000	2.94 E-6
0.7949	0.0056	109000	2000	2.80 E-6
0.8019	0.0070	111000	2000	3.50 E-6
0.8092	0.0073	113000	2000	3.64 E-6
0.8159	0.0067	115000	2000	3.36 E-6
0.8215	0.0056	117000	2000	2.80 E-6

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	2.80 E-6	0.0014	500
2	8.63 E-7	0.0045	3000
3	1.12 E-6	0.0085	7000
4	1.47 E-6	0.0137	11000
5	2.05 E-6	0.0187	14000
6	1.96 E-6	0.0227	16000
7	2.75 E-6	0.0274	18000
8	2.66 E-6	0.0328	20000
9	2.99 E-6	0.0385	22000
10	2.75 E-6	0.0442	24000
11	3.17 E-6	0.0501	26000
12	3.41 E-6	0.0567	28000
13	3.41 E-6	0.0635	30000
14	3.31 E-6	0.0702	32000
15	3.27 E-6	0.0768	34000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0028	1000
2	0.0063	5000
3	0.0107	9000
4	0.0166	13000
5	0.0207	15000
6	0.0246	17000
7	0.0301	19000
8	0.0355	21000
9	0.0414	23000
10	0.0469	25000
11	0.0533	27000
12	0.0601	29000
13	0.0669	31000
14	0.0735	33000
15	0.0801	(300) 35000

TABLE 131

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 6-L-12, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K2=10$ ,  $R=0.3$ ,  $U_c = -2.0$ ,  $S=2.5$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.5488	0.0036	17000	1000	3.64 E-6
0.5538	0.0050	22000	5000	1.01 E-6
0.5617	0.0078	27000	5000	1.57 E-6
0.5648	0.0031	29000	2000	1.54 E-6
0.5684	0.0036	31000	2000	1.82 E-6
0.5723	0.0039	33000	2000	1.96 E-6
0.5779	0.0056	35000	2000	2.80 E-6
0.5835	0.0056	37000	2000	2.80 E-6
0.5891	0.0056	39000	2000	2.80 E-6
0.5950	0.0059	41000	2000	2.94 E-6
0.6006	0.0056	43000	2000	2.80 E-6
0.6073	0.0067	45000	2000	3.36 E-6
0.6132	0.0059	47000	2000	2.94 E-6
0.6208	0.0076	49000	2000	3.78 E-6
0.6272	0.0064	51000	2000	3.22 E-6
0.6336	0.0064	53000	2000	3.22 E-6
0.6406	0.0070	55000	2000	3.50 E-6
0.6474	0.0067	57000	2000	3.36 E-6
0.6538	0.0064	59000	2000	3.22 E-6
0.6600	0.0062	61000	2000	3.08 E-6
RUN NO. 2				
0.6639	0.0039	62000	1000	3.92 E-6
0.6667	0.0028	67000	5000	5.60 E-7
0.6723	0.0056	72000	5000	1.12 E-6
0.6759	0.0036	74000	2000	1.82 E-6
0.6810	0.0050	76000	2000	2.52 E-6
0.6852	0.0042	78000	2000	2.10 E-6
0.6894	0.0042	80000	2000	2.10 E-6
0.6955	0.0062	82000	2000	3.08 E-6
0.7014	0.0059	84000	2000	2.94 E-6
0.7053	0.0039	86000	2000	1.96 E-6
0.7129	0.0076	88000	2000	3.78 E-6
0.7204	0.0076	90000	2000	3.78 E-6
0.7255	0.0050	92000	2000	2.52 E-6
0.7350	0.0095	94000	2000	4.76 E-6
0.7428	0.0078	96000	2000	3.92 E-6
0.7498	0.0070	98000	2000	3.50 E-6
0.7591	0.0092	100000	2000	4.62 E-6
0.7652	0.0062	102000	2000	3.08 E-6
0.7722	0.0070	104000	2000	3.50 E-6
0.7790	0.0067	106000	2000	3.36 E-6

(301)

TABLE 131 (continued)

RUN NO. 3

0.7820	0.0031	107000	1000	3.08 E-6
0.7868	0.0048	112000	5000	9.52 E-7
0.7913	0.0045	117000	5000	8.96 E-7
0.7946	0.0034	119000	2000	1.68 E-6
0.7983	0.0036	121000	2000	1.82 E-6
0.8030	0.0048	123000	2000	2.38 E-6
0.8078	0.0048	125000	2000	2.38 E-6
0.8131	0.0053	127000	2000	2.66 E-6
0.8173	0.0042	129000	2000	2.10 E-6
0.8235	0.0062	131000	2000	3.08 E-6
0.8288	0.0053	133000	2000	2.66 E-6
0.8355	0.0067	135000	2000	3.36 E-6
0.8428	0.0073	137000	2000	3.64 E-6
0.8495	0.0067	139000	2000	3.36 E-6
0.8560	0.0064	141000	2000	3.22 E-6
0.8641	0.0081	143000	2000	4.06 E-6
0.8711	0.0070	145000	2000	3.50 E-6
0.8772	0.0062	147000	2000	3.08 E-6
0.8837	0.0064	149000	2000	3.22 E-6
0.8912	0.0076	151000	2000	3.78 E-6

TABLE 131 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	3.55 E-6	0.0018	500
2	8.40 E-7	0.0056	3500
3	1.19 E-6	0.0107	8500
4	1.68 E-6	0.0154	12000
5	2.05 E-6	0.0191	14000
6	2.15 E-6	0.0233	16000
7	2.43 E-6	0.0279	18000
8	2.85 E-6	0.0332	20000
9	2.61 E-6	0.0386	22000
10	2.66 E-6	0.0439	24000
11	3.08 E-6	0.0497	26000
12	3.50 E-6	0.0562	28000
13	3.03 E-6	0.0628	30000
14	3.97 E-6	0.0698	32000
15	3.45 E-6	0.0772	34000
16	3.59 E-6	0.0842	36000
17	3.87 E-6	0.0917	38000
18	3.17 E-6	0.0987	40000
19	3.31 E-6	0.1052	42000
20	3.41 E-6	0.1120	44000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0035	1000
2	0.0077	6000
3	0.0137	11000
4	0.0171	13000
5	0.0212	15000
6	0.0255	17000
7	0.0303	19000
8	0.0360	21000
9	0.0413	23000
10	0.0466	25000
11	0.0527	27000
12	0.0597	29000
13	0.0658	31000
14	0.0737	33000
15	0.0806	35000
16	0.0878	37000
17	0.0956	39000
18	0.1019	41000
19	0.1085	43000
20	0.1154	45000

TABLE 132

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 1-1-19, TENSION-COMPRESSION  
 F=12Hz, K2=10, R=0.5,  $U_c = -1.0$ , S=2.5

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.8389	0.0022	10000	1000	2.24 E-6
0.8400	0.0011	14000	4000	2.80 E-7
0.8422	0.0022	18000	4000	5.60 E-7
0.8434	0.0011	20000	2000	5.60 E-7
0.8445	0.0011	22000	2000	5.60 E-7
0.8467	0.0022	24000	2000	1.12 E-6
0.8484	0.0017	26000	2000	8.40 E-7
0.8495	0.0011	28000	2000	5.60 E-7
0.8520	0.0025	30000	2000	1.26 E-6
0.8534	0.0014	32000	2000	7.00 E-7
0.8557	0.0022	34000	2000	1.12 E-6
0.8574	0.0017	36000	2000	8.40 E-7
0.8607	0.0034	38000	2000	1.68 E-6
0.8618	0.0011	40000	2000	5.60 E-7
0.8641	0.0022	42000	2000	1.12 E-6
0.8669	0.0028	44000	2000	1.40 E-6
RUN NO. 2				
0.9453	0.0014	143000	1000	1.40 E-6
0.9475	0.0022	147000	4000	5.60 E-7
0.9492	0.0017	151000	4000	4.20 E-7
0.9506	0.0014	153000	2000	7.00 E-7
0.9514	0.0008	155000	2000	4.20 E-7
0.9526	0.0011	157000	2000	5.60 E-7
0.9531	0.0006	159000	2000	2.80 E-7
0.9548	0.0017	161000	2000	8.40 E-7
0.9554	0.0006	163000	2000	2.80 E-7
0.9559	0.0006	165000	2000	2.80 E-7
0.9587	0.0028	167000	2000	1.40 E-6
0.9601	0.0014	169000	2000	7.00 E-7
0.9618	0.0017	171000	2000	8.40 E-7
0.9640	0.0022	173000	2000	1.12 E-6
0.9660	0.0020	175000	2000	9.80 E-7
0.9682	0.0022	177000	2000	1.12 E-6

TABLE 132 (continued)

RUN NO. 3

1.0004	0.0011	202000	1000	1.12 E-6
1.0027	0.0022	206000	4000	5.60 E-7
1.0044	0.0017	210000	4000	4.20 E-7
1.0058	0.0014	212000	2000	7.00 E-7
1.0063	0.0006	214000	2000	2.80 E-7
1.0069	0.0006	216000	2000	2.80 E-7
1.0080	0.0011	218000	2000	5.60 E-7
1.0091	0.0011	220000	2000	5.60 E-7
1.0100	0.0008	222000	2000	4.20 E-7
1.0125	0.0025	224000	2000	1.26 E-6
1.0144	0.0020	226000	2000	9.80 E-7
1.0158	0.0014	228000	2000	7.00 E-7
1.0178	0.0020	230000	2000	9.80 E-7
1.0200	0.0022	232000	2000	1.12 E-6
1.0214	0.0014	234000	2000	7.00 E-7
1.0240	0.0025	236000	2000	1.26 E-6

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	1.59 E-6	0.0008	500
2	4.67 E-7	0.0025	3000
3	4.67 E-7	0.0044	7000
4	6.53 E-7	0.0060	10000
5	4.20 E-7	0.0070	12000
6	6.53 E-7	0.0081	14000
7	5.60 E-7	0.0093	16000
8	6.53 E-7	0.0105	18000
9	6.53 E-7	0.0119	20000
10	7.47 E-7	0.0133	22000
11	1.17 E-6	0.0152	24000
12	7.47 E-7	0.0171	26000
13	1.17 E-6	0.0190	28000
14	9.33 E-7	0.0211	30000
15	9.33 E-7	0.0230	32000
16	1.26 E-6	0.0252	34000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0016	1000
2	0.0035	5000
3	0.0053	9000
4	0.0066	11000
5	0.0075	13000
6	0.0088	15000
7	0.0099	17000
8	0.0112	19000
9	0.0125	21000
10	0.0140	23000
11	0.0163	25000
12	0.0178	27000
13	0.0202	29000
14	0.0220	31000
15	0.0239	33000
16	0.0264	35000

(305)

TABLE 133

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 6-L-12, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.5$ ,  $U_c = -2$ ,  $S=2.5$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.0340	0.0014	10000	1000	1.40 E-6
1.0388	0.0047	20000	10000	4.76 E-7
1.0424	0.0036	25000	5000	7.28 E-7
1.0436	0.0011	27000	2000	5.60 E-7
1.0447	0.0011	29000	2000	5.60 E-7
1.0461	0.0014	31000	2000	7.00 E-7
1.0486	0.0025	33000	2000	1.26 E-6
1.0500	0.0014	35000	2000	7.00 E-7
1.0514	0.0014	37000	2000	7.00 E-7
1.0531	0.0017	39000	2000	8.40 E-7
1.0539	0.0008	41000	2000	4.20 E-7
1.0562	0.0022	43000	2000	1.12 E-6
1.0584	0.0022	45000	2000	1.12 E-6
1.0609	0.0025	47000	2000	1.26 E-6
1.0629	0.0020	49000	2000	9.80 E-7
1.0646	0.0017	51000	2000	8.40 E-7
1.0671	0.0025	53000	2000	1.26 E-6
1.0682	0.0011	55000	2000	5.60 E-7
1.0704	0.0022	57000	2000	1.12 E-6
RUN NO. 2				
1.1057	0.0008	88000	1000	8.40 E-7
1.1096	0.0039	98000	10000	3.92 E-7
1.1122	0.0025	103000	5000	5.04 E-7
1.1133	0.0011	105000	2000	5.60 E-7
1.1141	0.0008	107000	2000	4.20 E-7
1.1155	0.0014	109000	2000	7.00 E-7
1.1169	0.0014	111000	2000	7.00 E-7
1.1186	0.0017	113000	2000	8.40 E-7
1.1194	0.0008	115000	2000	4.20 E-7
1.1206	0.0011	117000	2000	5.60 E-7
1.1214	0.0008	119000	2000	4.20 E-7
1.1228	0.0014	121000	2000	7.00 E-7
1.1245	0.0017	123000	2000	8.40 E-7
1.1262	0.0017	125000	2000	8.40 E-7
1.1281	0.0020	127000	2000	9.80 E-7
1.1304	0.0022	129000	2000	1.12 E-6
1.1329	0.0025	131000	2000	1.26 E-6
1.1357	0.0028	133000	2000	1.40 E-6
1.1379	0.0022	135000	2000	1.12 E-6

TABLE 133 (continued)

RUN NO. 3

1.1788	0.0011	166000	1000	1.12 E-6
1.1827	0.0039	176000	10000	3.92 E-7
1.1844	0.0017	181000	5000	3.36 E-7
1.1847	0.0003	183000	2000	1.40 E-7
1.1855	0.0008	185000	2000	4.20 E-7
1.1869	0.0014	187000	2000	7.00 E-7
1.1880	0.0011	189000	2000	5.60 E-7
1.1889	0.0008	191000	2000	4.20 E-7
1.1903	0.0014	193000	2000	7.00 E-7
1.1920	0.0017	195000	2000	8.40 E-7
1.1934	0.0014	197000	2000	7.00 E-7
1.1953	0.0020	199000	2000	9.80 E-7
1.1967	0.0014	201000	2000	7.00 E-7
1.1987	0.0020	203000	2000	9.80 E-7
1.2006	0.0020	205000	2000	9.80 E-7
1.2023	0.0017	207000	2000	8.40 E-7
1.2051	0.0028	209000	2000	1.40 E-6
1.2071	0.0020	211000	2000	9.80 E-7
1.2090	0.0020	213000	2000	9.80 E-7



TABLE 133 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	1.12 E-6	0.0006	500
2	4.20 E-7	0.0032	6000
3	5.23 E-7	0.0066	13500
4	4.20 E-7	0.0083	17000
5	4.67 E-7	0.0092	19000
6	7.00 E-7	0.0104	21000
7	8.40 E-7	0.0119	23000
8	6.53 E-7	0.0134	25000
9	6.07 E-7	0.0147	27000
10	7.47 E-7	0.0160	29000
11	5.13 E-7	0.0173	31000
12	9.33 E-7	0.0187	33000
13	8.87 E-7	0.0206	35000
14	1.03 E-6	0.0225	37000
15	9.80 E-7	0.0245	39000
16	9.33 E-7	0.0264	41000
17	1.31 E-6	0.0286	43000
18	9.80 E-7	0.0309	45000
19	1.07 E-6	0.0330	47000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0011	1000
2	0.0053	11000
3	0.0079	16000
4	0.0087	18000
5	0.0097	20000
6	0.0111	22000
7	0.0128	24000
8	0.0141	26000
9	0.0153	28000
10	0.0168	30000
11	0.0178	32000
12	0.0197	34000
13	0.0214	36000
14	0.0235	38000
15	0.0255	40000
16	0.0273	42000
17	0.0299	44000
18	0.0319	46000
19	0.0340	48000

TABLE 134

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 4-L-11, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K2=10$ ,  $R=0.1$ ,  $U_c = -1.0$ ,  $S=3.0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.7241	0.0073	65000	2000	3.64 E-6
0.7325	0.0084	75000	10000	8.40 E-7
0.7431	0.0106	85000	10000	1.06 E-6
0.7510	0.0078	90000	5000	1.57 E-6
0.7599	0.0090	95000	5000	1.79 E-6
0.7734	0.0134	100000	5000	2.60 E-6
0.7820	0.0087	103000	3000	2.89 E-6
0.7907	0.0087	106000	3000	2.89 E-6
0.8008	0.0101	109000	3000	3.36 E-6
0.8081	0.0073	111000	2000	3.64 E-6
0.8142	0.0062	113000	2000	3.08 E-6
0.8215	0.0073	115000	2000	3.64 E-6
0.8296	0.0081	117000	2000	4.06 E-6
0.8378	0.0081	119000	2000	4.06 E-6
0.8456	0.0078	121000	2000	3.92 E-6
0.8540	0.0084	123000	2000	4.20 E-6
0.8602	0.0062	125000	2000	3.08 E-6
0.8680	0.0078	127000	2000	3.92 E-6
0.8772	0.0092	129000	2000	4.62 E-6
0.8854	0.0081	131000	2000	4.06 E-6
RUN NO. 2				
0.8893	0.0039	133000	2000	1.96 E-6
0.8988	0.0095	143000	10000	9.52 E-7
0.9106	0.0118	153000	10000	1.18 E-6
0.9184	0.0078	158000	5000	1.57 E-6
0.9302	0.0118	163000	5000	2.35 E-6
0.9430	0.0129	168000	5000	2.58 E-6
0.9500	0.0070	171000	3000	2.33 E-6
0.9615	0.0115	174000	3000	3.83 E-6
0.9724	0.0109	177000	3000	3.64 E-6
0.9789	0.0064	179000	2000	3.22 E-6
0.9856	0.0067	181000	2000	3.36 E-6
0.9946	0.0090	183000	2000	4.48 E-6
1.0032	0.0087	185000	2000	4.34 E-6
1.0105	0.0073	187000	2000	3.64 E-6
1.0192	0.0087	189000	2000	4.34 E-6
1.0276	0.0084	191000	2000	4.20 E-6
1.0343	0.0067	193000	2000	3.36 E-6
1.0427	0.0084	195000	2000	4.20 E-6
1.0511	0.0084	197000	2000	4.20 E-6
1.0587	0.0076	199000	2000	3.78 E-6

TABLE 134 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	2.80 E-6	0.0028	1000
2	8.96 E-7	0.0101	7000
3	1.12 E-6	0.0202	17000
4	1.57 E-6	0.0297	24500
5	2.07 E-6	0.0388	29500
6	2.64 E-6	0.0505	34500
7	2.61 E-6	0.0610	38500
8	3.36 E-6	0.0700	41500
9	3.50 E-6	0.0803	44500
10	3.43 E-6	0.0890	47000
11	3.22 E-6	0.0956	49000
12	4.06 E-6	0.1029	51000
13	4.20 E-6	0.1112	53000
14	3.85 E-6	0.1193	55000
15	4.13 E-6	0.1272	57000
16	4.20 E-6	0.1356	59000
17	3.22 E-6	0.1430	61000
18	4.06 E-6	0.1503	63000
19	4.41 E-6	0.1587	65000
20	3.92 E-6	0.1670	67000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0056	2000
2	0.0146	12000
3	0.0258	22000
4	0.0336	27000
5	0.0440	32000
6	0.0571	37000
7	0.0650	40000
8	0.0751	43000
9	0.0856	46000
10	0.0924	48000
11	0.0989	50000
12	0.1070	52000
13	0.1154	54000
14	0.1231	56000
15	0.1314	58000
16	0.1398	60000
17	0.1462	62000
18	0.1543	64000
19	0.1631	66000
20	0.1710	68000

TABLE 135

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 2-L-12, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K2=10$ ,  $R=0.1$ ,  $U_c = -2$ ,  $S=3.0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.3754	0.0048	3000	1000	4.76 E-6
1.3846	0.0093	23000	20000	4.62 E-7
1.3888	0.0042	38000	15000	2.80 E-7
1.3950	0.0061	48000	10000	6.16 E-7
1.4053	0.0104	56000	8000	1.29 E-6
1.4157	0.0104	62000	6000	1.73 E-6
1.4241	0.0084	66000	4000	2.10 E-6
1.4336	0.0095	70000	4000	2.38 E-6
1.4454	0.0118	74000	4000	2.94 E-6
1.4507	0.0053	76000	2000	2.66 E-6
1.4577	0.0070	78000	2000	3.50 E-6
1.4641	0.0064	80000	2000	3.22 E-6
1.4700	0.0059	82000	2000	2.94 E-6
1.4770	0.0070	84000	2000	3.50 E-6
1.4843	0.0073	86000	2000	3.64 E-6
1.4932	0.0090	88000	2000	4.48 E-6
1.5011	0.0078	90000	2000	3.92 E-6
1.5103	0.0092	92000	2000	4.62 E-6
1.5165	0.0062	94000	2000	3.08 E-6
1.5263	0.0098	96000	2000	4.90 E-6
1.5344	0.0081	98000	2000	4.06 E-6
1.5425	0.0081	100000	2000	4.06 E-6
1.5495	0.0070	102000	2000	3.50 E-6
1.5590	0.0095	104000	2000	4.76 E-6
1.5669	0.0078	106000	2000	3.92 E-6
1.5747	0.0078	108000	2000	3.92 E-6

TABLE 135 (continued)

RUN NO. 2

1.5798	0.0050	109000	1000	5.04 E-6
1.5865	0.0067	129000	20000	3.36 E-7
1.5901	0.0036	144000	15000	2.43 E-7
1.5926	0.0025	154000	10000	2.52 E-7
1.5968	0.0042	162000	8000	5.25 E-7
1.6022	0.0053	168000	6000	8.87 E-7
1.6058	0.0036	172000	4000	9.10 E-7
1.6122	0.0064	176000	4000	1.61 E-6
1.6201	0.0078	180000	4000	1.96 E-6
1.6246	0.0045	182000	2000	2.24 E-6
1.6296	0.0050	184000	2000	2.52 E-6
1.6335	0.0039	186000	2000	1.96 E-6
1.6388	0.0053	188000	2000	2.66 E-6
1.6436	0.0048	190000	2000	2.38 E-6
1.6506	0.0070	192000	2000	3.50 E-6
1.6559	0.0053	194000	2000	2.66 E-6
1.6618	0.0059	196000	2000	2.94 E-6
1.6685	0.0067	198000	2000	3.36 E-6
1.6752	0.0067	200000	2000	3.36 E-6
1.6814	0.0062	202000	2000	3.08 E-6
1.6876	0.0062	204000	2000	3.08 E-6
1.6962	0.0087	206000	2000	4.34 E-6
1.7038	0.0076	208000	2000	3.78 E-6
1.7108	0.0070	210000	2000	3.50 E-6
1.7189	0.0081	212000	2000	4.06 E-6
1.7273	0.0084	214000	2000	4.20 E-6

TABLE 135 (continued)  
AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	4.90 E-6	0.0024	500
2	3.99 E-7	0.0089	11000
3	2.61 E-7	0.0149	28500
4	4.34 E-7	0.0190	41000
5	9.07 E-7	0.0248	50000
6	1.31 E-6	0.0324	57000
7	1.50 E-6	0.0393	62000
8	1.99 E-6	0.0463	66000
9	2.45 E-6	0.0552	70000
10	2.45 E-6	0.0626	73000
11	3.01 E-6	0.0680	75000
12	2.59 E-6	0.0736	77000
13	2.80 E-6	0.0790	79000
14	2.94 E-6	0.0847	81000
15	3.57 E-6	0.0912	83000
16	3.57 E-6	0.0984	85000
17	3.43 E-6	0.1054	87000
18	3.99 E-6	0.1128	89000
19	3.22 E-6	0.1200	91000
20	3.99 E-6	0.1272	93000
21	3.57 E-6	0.1348	95000
22	4.20 E-6	0.1426	97000
23	3.64 E-6	0.1504	99000
24	4.13 E-6	0.1582	101000
25	3.99 E-6	0.1663	103000
26	4.06 E-6	0.1743	105000

AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0049	1000
2	0.0129	21000
3	0.0168	36000
4	0.0211	46000
5	0.0284	54000
6	0.0363	60000
7	0.0423	64000
8	0.0503	68000
9	0.0601	72000
10	0.0650	74000
11	0.0710	76000
12	0.0762	78000
13	0.0818	80000
14	0.0877	82000
15	0.0948	84000
16	0.1020	86000
17	0.1088	88000
18	0.1168	90000
19	0.1232	92000
20	0.1312	94000
21	0.1384	96000
22	0.1468	98000
23	0.1540	100000
24	0.1623	102000
25	0.1703	104000
26	0.1784	106000

TABLE 136

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 4-L-11, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K2=10$ ,  $R=0.3$ ,  $U_c = -1.0$ ,  $S=3.0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.1166	0.0031	20000	2000	1.54 E-6
1.1228	0.0062	30000	10000	6.16 E-7
1.1284	0.0056	40000	10000	5.60 E-7
1.1374	0.0090	50000	10000	8.96 E-7
1.1525	0.0151	60000	10000	1.51 E-6
1.1626	0.0101	65000	5000	2.02 E-6
1.1704	0.0078	69000	4000	1.96 E-6
1.1794	0.0089	73000	4000	2.24 E-6
1.1889	0.0095	77000	4000	2.38 E-6
1.1945	0.0056	79000	2000	2.80 E-6
1.1984	0.0039	81000	2000	1.96 E-6
1.2034	0.0089	83000	2000	2.52 E-6
1.2096	0.0062	85000	2000	3.08 E-6
1.2163	0.0067	87000	2000	3.36 E-6
1.2230	0.0067	89000	2000	3.36 E-6
1.2281	0.0050	91000	2000	2.52 E-6
1.2337	0.0056	93000	2000	2.80 E-6
1.2410	0.0073	95000	2000	3.64 E-6
1.2466	0.0056	97000	2000	2.80 E-6
1.2522	0.0056	99000	2000	2.80 E-6
RUN NO. 2				
1.2550	0.0028	101000	2000	1.40 E-6
1.2611	0.0062	111000	10000	6.16 E-7
1.2650	0.0039	121000	10000	3.92 E-7
1.2701	0.0050	131000	10000	5.04 E-7
1.2807	0.0106	141000	10000	1.06 E-6
1.2874	0.0067	146000	5000	1.34 E-6
1.2908	0.0034	150000	4000	8.40 E-7
1.2984	0.0076	154000	4000	1.89 E-6
1.3054	0.0070	158000	4000	1.75 E-6
1.3087	0.0034	160000	2000	1.68 E-6
1.3126	0.0039	162000	2000	1.96 E-6
1.3171	0.0045	164000	2000	2.24 E-6
1.3216	0.0045	166000	2000	2.24 E-6
1.3258	0.0042	168000	2000	2.10 E-6
1.3303	0.0045	170000	2000	2.24 E-6
1.3350	0.0048	172000	2000	2.38 E-6
1.3404	0.0053	174000	2000	2.66 E-6
1.3451	0.0048	176000	2000	2.38 E-6
1.3513	0.0062	178000	2000	3.08 E-6
1.3552	0.0039	180000	2000	1.96 E-6

(3/4)

TABLE 136 (continued)

RUN NO. 3

1.4784	0.0042	223000	2000	2.10 E-6
1.4837	0.0053	233000	10000	5.32 E-7
1.4879	0.0042	243000	10000	4.20 E-7
1.4932	0.0053	253000	10000	5.32 E-7
1.5008	0.0076	263000	10000	7.56 E-7
1.5061	0.0053	268000	5000	1.06 E-6
1.5120	0.0059	272000	4000	1.47 E-6
1.5182	0.0062	276000	4000	1.54 E-6
1.5252	0.0070	280000	4000	1.75 E-6
1.5285	0.0034	282000	2000	1.68 E-6
1.5330	0.0045	284000	2000	2.24 E-6
1.5378	0.0048	286000	2000	2.38 E-6
1.5428	0.0050	288000	2000	2.52 E-6
1.5476	0.0048	290000	2000	2.38 E-6
1.5520	0.0045	292000	2000	2.24 E-6
1.5568	0.0048	294000	2000	2.38 E-6
1.5613	0.0045	296000	2000	2.24 E-6
1.5672	0.0059	298000	2000	2.94 E-6
1.5728	0.0056	300000	2000	2.80 E-6
1.5786	0.0059	302000	2000	2.94 E-6



TABLE 136 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	1.68 E-6	0.0017	1000
2	5.88 E-7	0.0063	7000
3	4.57 E-7	0.0115	17000
4	6.44 E-7	0.0170	27000
5	1.11 E-6	0.0258	37000
6	1.47 E-6	0.0350	44500
7	1.42 E-6	0.0416	49000
8	1.89 E-6	0.0482	53000
9	1.96 E-6	0.0559	57000
10	2.05 E-6	0.0618	60000
11	2.05 E-6	0.0659	62000
12	2.38 E-6	0.0710	64000
13	2.61 E-6	0.0767	66000
14	2.61 E-6	0.0819	68000
15	2.61 E-6	0.0871	70000
16	2.43 E-6	0.0921	72000
17	2.57 E-6	0.0971	74000
18	2.99 E-6	0.1027	76000
19	2.89 E-6	0.1086	78000
20	2.57 E-6	0.1140	80000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0034	2000
2	0.0092	12000
3	0.0138	22000
4	0.0203	32000
5	0.0314	42000
6	0.0387	47000
7	0.0444	51000
8	0.0520	55000
9	0.0598	59000
10	0.0639	61000
11	0.0680	63000
12	0.0740	65000
13	0.0793	67000
14	0.0845	69000
15	0.0897	71000
16	0.0946	73000
17	0.0997	75000
18	0.1057	77000
19	0.1115	79000
20	0.1166	81000

TABLE 137

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 5-1-7, TENSION-COMPRESSION  
 F=12Hz, K2=10, R=0.3,  $U_c = -2$ , S=3.0

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.0242	0.0045	45000	2000	2.24 E-6
1.0301	0.0059	65000	20000	2.94 E-7
1.0419	0.0118	85000	20000	5.88 E-7
1.0632	0.0213	100000	15000	1.42 E-6
1.0842	0.0210	110000	10000	2.10 E-6
1.0982	0.0140	116000	6000	2.34 E-6
1.1085	0.0104	120000	4000	2.59 E-6
1.1197	0.0112	124000	4000	2.80 E-6
1.1292	0.0095	128000	4000	2.38 E-6
1.1340	0.0048	130000	2000	2.38 E-6
1.1393	0.0053	132000	2000	2.66 E-6
1.1449	0.0056	134000	2000	2.80 E-6
1.1502	0.0053	136000	2000	2.66 E-6
1.1556	0.0053	138000	2000	2.66 E-6
1.1623	0.0067	140000	2000	3.36 E-6
1.1684	0.0062	142000	2000	3.08 E-6
1.1743	0.0059	144000	2000	2.94 E-6
1.1796	0.0053	146000	2000	2.66 E-6
1.1864	0.0067	148000	2000	3.36 E-6
1.1914	0.0050	150000	2000	2.52 E-6
RUN NO. 2				
1.2813	0.0034	180000	2000	1.68 E-6
1.2874	0.0062	200000	20000	3.08 E-7
1.2961	0.0087	220000	20000	4.34 E-7
1.3082	0.0120	235000	15000	8.03 E-7
1.3238	0.0157	245000	10000	1.57 E-6
1.3381	0.0143	251000	6000	2.38 E-6
1.3451	0.0070	255000	4000	1.75 E-6
1.3541	0.0090	259000	4000	2.24 E-6
1.3642	0.0101	263000	4000	2.52 E-6
1.3686	0.0045	265000	2000	2.24 E-6
1.3742	0.0056	267000	2000	2.80 E-6
1.3793	0.0050	269000	2000	2.52 E-6
1.3846	0.0053	271000	2000	2.66 E-6
1.3894	0.0048	273000	2000	2.38 E-6
1.3958	0.0064	275000	2000	3.22 E-6
1.4006	0.0048	277000	2000	2.38 E-6
1.4064	0.0059	279000	2000	2.94 E-6
1.4106	0.0042	281000	2000	2.10 E-6
1.4162	0.0056	283000	2000	2.80 E-6
1.4216	0.0053	285000	2000	2.66 E-6

TABLE 137 (continued)

RUN NO. 3

1.5058	0.0039	315000	2000	1.96 E-6
1.5131	0.0073	335000	20000	3.64 E-7
1.5159	0.0028	355000	20000	1.40 E-7
1.5201	0.0042	370000	15000	2.80 E-7
1.5268	0.0067	380000	10000	6.72 E-7
1.5344	0.0076	386000	6000	1.26 E-6
1.5394	0.0050	390000	4000	1.26 E-6
1.5453	0.0059	394000	4000	1.47 E-6
1.5534	0.0081	398000	4000	2.03 E-6
1.5579	0.0045	400000	2000	2.24 E-6
1.5624	0.0045	402000	2000	2.24 E-6
1.5660	0.0036	404000	2000	1.82 E-6
1.5708	0.0048	406000	2000	2.38 E-6
1.5770	0.0062	408000	2000	3.08 E-6
1.5809	0.0039	410000	2000	1.96 E-6
1.5862	0.0053	412000	2000	2.66 E-6
1.5915	0.0053	414000	2000	2.66 E-6
1.5960	0.0045	416000	2000	2.24 E-6
1.6019	0.0059	418000	2000	2.94 E-6
1.6072	0.0053	420000	2000	2.66 E-6

TABLE 137 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	1.96 E-6	0.0020	1000
2	3.22 E-7	0.0072	12000
3	3.87 E-7	0.0143	32000
4	8.34 E-7	0.0244	49500
5	1.45 E-6	0.0379	62000
6	1.99 E-6	0.0511	70000
7	1.87 E-6	0.0608	75000
8	2.17 E-6	0.0689	79000
9	2.31 E-6	0.0779	83000
10	2.29 E-6	0.0848	86000
11	2.57 E-6	0.0896	88000
12	2.38 E-6	0.0946	90000
13	2.57 E-6	0.0995	92000
14	2.71 E-6	0.1048	94000
15	2.85 E-6	0.1103	96000
16	2.71 E-6	0.1159	98000
17	2.85 E-6	0.1214	100000
18	2.33 E-6	0.1266	102000
19	3.03 E-6	0.1320	104000
20	2.61 E-6	0.1376	106000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0039	2000
2	0.0104	22000
3	0.0181	42000
4	0.0307	57000
5	0.0451	67000
6	0.0571	73000
7	0.0646	77000
8	0.0732	81000
9	0.0825	85000
10	0.0871	87000
11	0.0922	89000
12	0.0969	91000
13	0.1021	93000
14	0.1075	95000
15	0.1132	97000
16	0.1186	99000
17	0.1243	101000
18	0.1289	103000
19	0.1350	105000
20	0.1402	107000

TABLE 138

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 5-L-7, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K2=10$ ,  $R=0.5$ ,  $U_c = -1$ ,  $S=3.0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.6244	0.0017	145000	2000	8.40 E-7
0.6306	0.0062	155000	10000	6.16 E-7
0.6367	0.0062	165000	10000	6.16 E-7
0.6418	0.0050	175000	10000	5.04 E-7
0.6504	0.0087	185000	10000	8.68 E-7
0.6552	0.0048	190000	5000	9.52 E-7
0.6574	0.0022	193000	3000	7.47 E-7
0.6602	0.0028	196000	3000	9.33 E-7
0.6622	0.0020	199000	3000	6.53 E-7
0.6653	0.0031	202000	3000	1.03 E-6
0.6686	0.0034	205000	3000	1.12 E-6
0.6720	0.0034	208000	3000	1.12 E-6
0.6748	0.0028	211000	3000	9.33 E-7
0.6784	0.0036	214000	3000	1.21 E-6
0.6818	0.0034	217000	3000	1.12 E-6
0.6843	0.0025	220000	3000	8.40 E-7
0.6866	0.0022	223000	3000	7.47 E-7
0.6896	0.0031	226000	3000	1.03 E-6
0.6930	0.0034	229000	3000	1.12 E-6
0.6961	0.0031	232000	3000	1.03 E-6
RUN NO. 2				
0.7339	0.0025	274000	2000	1.26 E-6
0.7381	0.0042	284000	10000	4.20 E-7
0.7431	0.0050	294000	10000	5.04 E-7
0.7493	0.0062	304000	10000	6.16 E-7
0.7571	0.0078	314000	10000	7.84 E-7
0.7613	0.0042	319000	5000	8.40 E-7
0.7650	0.0036	322000	3000	1.21 E-6
0.7678	0.0028	325000	3000	9.33 E-7
0.7708	0.0031	328000	3000	1.03 E-6
0.7734	0.0025	331000	3000	8.40 E-7
0.7773	0.0039	334000	3000	1.31 E-6
0.7806	0.0034	337000	3000	1.12 E-6
0.7846	0.0039	340000	3000	1.31 E-6
0.7871	0.0025	343000	3000	8.40 E-7
0.7913	0.0042	346000	3000	1.40 E-6
0.7941	0.0028	349000	3000	9.33 E-7
0.7977	0.0036	352000	3000	1.21 E-6
0.8008	0.0031	355000	3000	1.03 E-6
0.8050	0.0042	358000	3000	1.40 E-6
0.8075	0.0025	361000	3000	8.40 E-7

TABLE 138 (continued)

RUN NO. 3

0.8403	0.0014	393000	2000	7.00 E-7
0.8453	0.0050	403000	10000	5.04 E-7
0.8495	0.0042	413000	10000	4.20 E-7
0.8562	0.0067	423000	10000	6.72 E-7
0.8613	0.0050	433000	10000	5.04 E-7
0.8646	0.0034	438000	5000	6.72 E-7
0.8655	0.0008	441000	3000	2.80 E-7
0.8680	0.0025	444000	3000	8.40 E-7
0.8697	0.0017	447000	3000	5.60 E-7
0.8722	0.0025	450000	3000	8.40 E-7
0.8758	0.0036	453000	3000	1.21 E-6
0.8775	0.0017	456000	3000	5.60 E-7
0.8809	0.0034	459000	3000	1.12 E-6
0.8840	0.0031	462000	3000	1.03 E-6
0.8854	0.0014	465000	3000	4.67 E-7
0.8890	0.0036	468000	3000	1.21 E-6
0.8921	0.0031	471000	3000	1.03 E-6
0.8954	0.0034	474000	3000	1.12 E-6
0.8985	0.0031	477000	3000	1.03 E-6
0.9022	0.0036	480000	3000	1.21 E-6

TABLE 138 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	9.33 E-7	0.0009	1000
2	5.13 E-7	0.0044	7000
3	5.13 E-7	0.0096	17000
4	5.97 E-7	0.0151	27000
5	7.19 E-7	0.0217	37000
6	8.21 E-7	0.0273	44500
7	7.47 E-7	0.0305	48500
8	9.02 E-7	0.0330	51500
9	7.47 E-7	0.0355	54500
10	9.02 E-7	0.0379	57500
11	1.21 E-6	0.0411	60500
12	9.33 E-7	0.0443	63500
13	1.12 E-6	0.0474	66500
14	1.03 E-6	0.0506	69500
15	9.96 E-7	0.0537	72500
16	9.96 E-7	0.0567	75500
17	9.96 E-7	0.0596	78500
18	1.06 E-6	0.0627	81500
19	1.18 E-6	0.0661	84500
20	1.03 E-6	0.0694	87500

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0019	2000
2	0.0070	12000
3	0.0121	22000
4	0.0181	32000
5	0.0253	42000
6	0.0294	47000
7	0.0316	50000
8	0.0343	53000
9	0.0366	56000
10	0.0393	59000
11	0.0429	62000
12	0.0457	65000
13	0.0491	68000
14	0.0522	71000
15	0.0552	74000
16	0.0581	77000
17	0.0611	80000
18	0.0643	83000
19	0.0679	86000
20	0.0709	89000

TABLE 139

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 5-L-14, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K2=10$ ,  $R=0.5$ ,  $U_c = -2$ ,  $S=3.0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.5527	0.0006	7000	1000	5.60 E-7
0.5645	0.0117	42000	35000	3.27 E-7
0.5667	0.0022	60000	18000	1.26 E-7
0.5690	0.0022	70000	10000	2.34 E-7
0.5712	0.0022	78000	8000	2.80 E-7
0.5740	0.0028	86000	8000	3.50 E-7
0.5762	0.0022	90000	4000	5.60 E-7
0.5779	0.0017	94000	4000	4.20 E-7
0.5807	0.0028	98000	4000	7.00 E-7
0.5841	0.0034	102000	4000	8.40 E-7
0.5863	0.0022	106000	4000	5.60 E-7
0.5880	0.0017	108000	2000	8.40 E-7
0.5902	0.0022	110000	2000	1.12 E-6
0.5914	0.0011	112000	2000	5.60 E-7
0.5922	0.0008	114000	2000	4.20 E-7
0.5939	0.0017	116000	2000	8.40 E-7
0.5961	0.0022	118000	2000	1.12 E-6
0.5975	0.0014	120000	2000	7.00 E-7
0.5995	0.0020	122000	2000	9.80 E-7
0.6020	0.0025	124000	2000	1.26 E-6
0.6042	0.0022	126000	2000	1.12 E-6
0.6065	0.0022	128000	2000	1.12 E-6
0.6090	0.0025	130000	2000	1.26 E-6
0.6115	0.0025	132000	2000	1.26 E-6
0.6132	0.0017	134000	2000	8.40 E-7
0.6152	0.0020	136000	2000	9.80 E-7
0.6174	0.0022	138000	2000	1.12 E-6
0.6196	0.0022	140000	2000	1.12 E-6
0.6216	0.0020	142000	2000	9.80 E-7



TABLE 139 (continued)

RUN NO. 2

0.7280	0.0011	279000	1000	1.12 E-6
0.7386	0.0106	314000	35000	3.04 E-7
0.7437	0.0050	332000	18000	2.80 E-7
0.7459	0.0022	342000	10000	2.24 E-7
0.7482	0.0022	350000	8000	2.80 E-7
0.7504	0.0022	358000	8000	2.80 E-7
0.7510	0.0006	362000	4000	1.40 E-7
0.7538	0.0028	366000	4000	7.00 E-7
0.7554	0.0017	370000	4000	4.20 E-7
0.7577	0.0022	374000	4000	5.60 E-7
0.7599	0.0022	378000	4000	5.60 E-7
0.7616	0.0017	380000	2000	8.40 E-7
0.7622	0.0006	382000	2000	2.80 E-7
0.7641	0.0020	384000	2000	9.80 E-7
0.7655	0.0014	386000	2000	7.00 E-7
0.7672	0.0017	388000	2000	8.40 E-7
0.7686	0.0014	390000	2000	7.00 E-7
0.7706	0.0020	392000	2000	9.80 E-7
0.7722	0.0017	394000	2000	8.40 E-7
0.7748	0.0025	396000	2000	1.26 E-6
0.7759	0.0011	398000	2000	5.60 E-7
0.7776	0.0017	400000	2000	8.40 E-7
0.7792	0.0017	402000	2000	8.40 E-7
0.7809	0.0017	404000	2000	8.40 E-7
0.7829	0.0020	406000	2000	9.80 E-7
0.7860	0.0031	408000	2000	1.54 E-6
0.7879	0.0020	410000	2000	9.80 E-7
0.7900	0.0021	412000	2000	1.04 E-6
0.7921	0.0021	414000	2000	1.06 E-6

TABLE 139 (continued)

RUN NO. 3

0.8201	0.0022	435000	1000	2.24 E-6
0.8277	0.0076	470000	35000	2.16 E-7
0.8322	0.0045	488000	18000	2.49 E-7
0.8355	0.0034	498000	10000	3.36 E-7
0.8389	0.0034	506000	8000	4.20 E-7
0.8417	0.0028	514000	8000	3.50 E-7
0.8436	0.0020	518000	4000	4.90 E-7
0.8453	0.0017	522000	4000	4.20 E-7
0.8476	0.0022	526000	4000	5.60 E-7
0.8509	0.0034	530000	4000	8.40 E-7
0.8532	0.0022	534000	4000	5.60 E-7
0.8543	0.0011	536000	2000	5.60 E-7
0.8562	0.0020	538000	2000	9.80 E-7
0.8576	0.0014	540000	2000	7.00 E-7
0.8599	0.0022	542000	2000	1.12 E-6
0.8610	0.0011	544000	2000	5.60 E-7
0.8635	0.0025	546000	2000	1.26 E-6
0.8660	0.0025	548000	2000	1.26 E-6
0.8680	0.0020	550000	2000	9.80 E-7
0.8691	0.0011	552000	2000	5.60 E-7
0.8708	0.0017	554000	2000	8.40 E-7
0.8725	0.0017	556000	2000	8.40 E-7
0.8742	0.0017	558000	2000	8.40 E-7
0.8753	0.0011	560000	2000	5.60 E-7
0.8781	0.0028	562000	2000	1.40 E-6
0.8800	0.0020	564000	2000	9.80 E-7
0.8820	0.0020	566000	2000	9.80 E-7
0.8840	0.0020	568000	2000	9.80 E-7
0.8862	0.0022	570000	2000	1.12 E-6

TABLE 139 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	1.31 E-6	0.0007	500
2	2.82 E-7	0.0063	18500
3	2.18 E-7	0.0132	45000
4	2.65 E-7	0.0165	59000
5	3.27 E-7	0.0191	68000
6	3.27 E-7	0.0217	76000
7	3.97 E-7	0.0238	82000
8	5.13 E-7	0.0256	86000
9	5.60 E-7	0.0277	90000
10	7.47 E-7	0.0304	94000
11	5.60 E-7	0.0330	98000
12	7.47 E-7	0.0348	101000
13	7.93 E-7	0.0364	103000
14	7.47 E-7	0.0379	105000
15	7.47 E-7	0.0394	107000
16	7.47 E-7	0.0409	109000
17	1.03 E-6	0.0427	111000
18	9.80 E-7	0.0447	113000
19	9.33 E-7	0.0466	115000
20	1.03 E-6	0.0485	117000
21	8.40 E-7	0.0504	119000
22	9.33 E-7	0.0522	121000
23	9.80 E-7	0.0541	123000
24	8.87 E-7	0.0560	125000
25	1.07 E-6	0.0579	127000
26	1.17 E-6	0.0602	129000
27	1.03 E-6	0.0624	131000
28	1.05 E-6	0.0644	133000
29	1.05 E-6	0.0665	135000

TABLE 139 (continued)

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0013	1000
2	0.0113	36000
3	0.0152	54000
4	0.0178	64000
5	0.0204	72000
6	0.0230	80000
7	0.0246	84000
8	0.0266	88000
9	0.0289	92000
10	0.0319	96000
11	0.0341	100000
12	0.0356	102000
13	0.0372	104000
14	0.0387	106000
15	0.0401	108000
16	0.0416	110000
17	0.0437	112000
18	0.0456	114000
19	0.0475	116000
20	0.0496	118000
21	0.0512	120000
22	0.0531	122000
23	0.0551	124000
24	0.0568	126000
25	0.0590	128000
26	0.0613	130000
27	0.0634	132000
28	0.0655	134000
29	0.0676	136000

TABLE 140

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 3-L-7, TENSION-COMPRESSION  
 $F = 12\text{Hz}$ ,  $K_2 = 10$ ,  $R = 0.1$ ,  $U_c = -1$ ,  $S = 3.5$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.1560	0.0081	5000	1000	8.12 E-6
1.1740	0.0173	35000	30000	5.79 E-7
1.1827	0.0087	55000	20000	4.34 E-7
1.2006	0.0179	75000	20000	8.96 E-7
1.2180	0.0174	84750	9750	1.78 E-6
1.2253	0.0073	88750	4000	1.82 E-6
1.2365	0.0112	92750	4000	2.80 E-6
1.2466	0.0100	96750	4000	2.52 E-6
1.2589	0.0123	100750	4000	3.08 E-6
1.2645	0.0056	102750	2000	2.80 E-6
1.2706	0.0062	104750	2000	3.08 E-6
1.2774	0.0067	106750	2000	3.36 E-6
1.2846	0.0073	108750	2000	3.64 E-6
1.2914	0.0067	110750	2000	3.36 E-6
1.2986	0.0073	112750	2000	3.64 E-6
1.3054	0.0067	114750	2000	3.36 E-6
1.3129	0.0076	116750	2000	3.78 E-6
1.3191	0.0062	118750	2000	3.08 E-6
1.3269	0.0078	120750	2000	3.92 E-6
1.3345	0.0076	122750	2000	3.78 E-6
1.3426	0.0081	124750	2000	4.04 E-6
1.3499	0.0073	126750	2000	3.64 E-6
1.3577	0.0078	128750	2000	3.92 E-6
1.3653	0.0076	130750	2000	3.78 E-6
1.3740	0.0087	132750	2000	4.34 E-6
1.3829	0.0090	134750	2000	4.48 E-6
1.3927	0.0098	136750	2000	4.90 E-6
1.4011	0.0084	138750	2000	4.20 E-6
1.4104	0.0092	140750	2000	4.62 E-6

TABLE 140 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	8.12 E-6	0.0041	500
2	5.79 E-7	0.0168	16000
3	4.34 E-7	0.0298	41000
4	8.96 E-7	0.0431	61000
5	1.78 E-6	0.0607	75875
6	1.82 E-6	0.0731	82750
7	2.80 E-6	0.0823	86750
8	2.52 E-6	0.0929	90750
9	3.08 E-6	0.1041	94750
10	2.80 E-6	0.1130	97750
11	3.08 E-6	0.1189	99750
12	3.36 E-6	0.1254	101750
13	3.64 E-6	0.1324	103750
14	3.36 E-6	0.1394	105750
15	3.64 E-6	0.1464	107750
16	3.36 E-6	0.1534	109750
17	3.78 E-6	0.1605	111750
18	3.08 E-6	0.1674	113750
19	3.92 E-6	0.1744	115750
20	3.78 E-6	0.1821	117750
21	4.04 E-6	0.1900	119750
22	3.64 E-6	0.1977	121750
23	3.92 E-6	0.2052	123750
24	3.78 E-6	0.2129	125750
25	4.34 E-6	0.2211	127750
26	4.48 E-6	0.2299	129750
27	4.90 E-6	0.2393	131750
28	4.20 E-6	0.2484	133750
29	4.62 E-6	0.2572	135750

TABLE 140 (continued)

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0081	1000
2	0.0254	31000
3	0.0341	51000
4	0.0520	71000
5	0.0694	80750
6	0.0767	84750
7	0.0879	88750
8	0.0979	92750
9	0.1102	96750
10	0.1158	98750
11	0.1220	100750
12	0.1287	102750
13	0.1360	104750
14	0.1427	106750
15	0.1500	108750
16	0.1567	110750
17	0.1643	112750
18	0.1705	114750
19	0.1783	116750
20	0.1859	118750
21	0.1940	120750
22	0.2013	122750
23	0.2091	124750
24	0.2167	126750
25	0.2254	128750
26	0.2344	130750
27	0.2442	132750
28	0.2526	134750
29	0.2618	136750

TABLE 141

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 3-L-7. TENSION-COMPRESSION

F=12Hz,  $K_2=10$ , R=0.1,  $U_c = -2$ , S=3.5

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.5131	0.0088	19000	1000	8.84 E-6
1.5232	0.0101	59000	40000	2.52 E-7
1.5277	0.0045	99000	40000	1.12 E-7
1.5344	0.0067	139000	40000	1.68 E-7
1.5366	0.0022	159000	20000	1.12 E-7
1.5406	0.0039	179000	20000	1.96 E-7
1.5445	0.0039	199000	20000	1.96 E-7
1.5501	0.0056	219000	20000	2.80 E-7
1.5635	0.0134	239000	20000	6.72 E-7
1.5814	0.0179	249000	10000	1.79 E-6
1.5921	0.0106	254000	5000	2.13 E-6
1.5971	0.0050	256000	2000	2.52 E-6
1.6005	0.0034	258000	2000	1.68 E-6
1.6050	0.0045	260000	2000	2.24 E-6
1.6106	0.0056	262000	2000	2.80 E-6
1.6167	0.0062	264000	2000	3.08 E-6
1.6234	0.0067	266000	2000	3.36 E-6
1.6279	0.0045	268000	2000	2.24 E-6
1.6352	0.0073	270000	2000	3.64 E-6
1.6425	0.0073	272000	2000	3.64 E-6
1.6475	0.0050	274000	2000	2.52 E-6
1.6559	0.0084	276000	2000	4.20 E-6
1.6621	0.0062	278000	2000	3.08 E-6
1.6677	0.0056	280000	2000	2.80 E-6
1.6755	0.0078	282000	2000	3.92 E-6
1.6822	0.0067	284000	2000	3.36 E-6
1.6901	0.0078	286000	2000	3.92 E-6
1.6985	0.0084	288000	2000	4.20 E-6
1.7069	0.0084	290000	2000	4.20 E-6



TABLE 141 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	8.84 E-6	0.0044	500
2	2.52 E-7	0.0139	21000
3	1.12 E-7	0.0212	61000
4	1.68 E-7	0.0268	101000
5	1.12 E-7	0.0312	131000
6	1.96 E-7	0.0343	151000
7	1.96 E-7	0.0382	171000
8	2.80 E-7	0.0430	191000
9	6.72 E-7	0.0525	211000
10	1.79 E-6	0.0682	226000
11	2.13 E-6	0.0825	233500
12	2.52 E-6	0.0903	237000
13	1.68 E-6	0.0945	239000
14	2.24 E-6	0.0984	241000
15	2.80 E-6	0.1035	243000
16	3.08 E-6	0.1094	245000
17	3.36 E-6	0.1158	247000
18	2.24 E-6	0.1214	249000
19	3.64 E-6	0.1273	251000
20	3.64 E-6	0.1346	253000
21	2.52 E-6	0.1407	255000
22	4.20 E-6	0.1474	257000
23	3.08 E-6	0.1547	259000
24	2.80 E-6	0.1606	261000
25	3.92 E-6	0.1673	263000
26	3.36 E-6	0.1746	265000
27	3.92 E-6	0.1819	267000
28	4.20 E-6	0.1900	269000
29	4.20 E-6	0.1984	271000

TABLE 141 (continued)

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0088	1000
2	0.0189	41000
3	0.0234	81000
4	0.0301	121000
5	0.0324	141000
6	0.0363	161000
7	0.0402	181000
8	0.0458	201000
9	0.0592	221000
10	0.0772	231000
11	0.0878	236000
12	0.0928	238000
13	0.0962	240000
14	0.1007	242000
15	0.1063	244000
16	0.1124	246000
17	0.1192	248000
18	0.1236	250000
19	0.1309	252000
20	0.1382	254000
21	0.1432	256000
22	0.1516	258000
23	0.1578	260000
24	0.1634	262000
25	0.1712	264000
26	0.1780	266000
27	0.1858	268000
28	0.1942	270000
29	0.2026	272000

Data adjusted to reflect growth of one crack tip.

TABLE 142

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 6-L-15, TENSION-COMPRESSION

$F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.3$ ,  $U_c = -1.0$ ,  $S=3.5$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.0016	0.0036	37000	1000	3.64 E-6
1.0198	0.0182	67000	30000	6.07 E-7
1.0464	0.0266	92000	25000	1.06 E-6
1.0531	0.0067	97000	5000	1.34 E-6
1.0601	0.0070	101000	4000	1.75 E-6
1.0665	0.0065	105000	4000	1.61 E-6
1.0735	0.0070	109000	4000	1.75 E-6
1.0805	0.0070	113000	4000	1.75 E-6
1.0898	0.0092	117000	4000	2.31 E-6
1.0990	0.0092	121000	4000	2.31 E-6
1.1091	0.0101	125000	4000	2.52 E-6
1.1192	0.0101	129000	4000	2.52 E-6
1.1295	0.0104	133000	4000	2.59 E-6
1.1393	0.0098	137000	4000	2.45 E-6
1.1497	0.0104	141000	4000	2.59 E-6
1.1612	0.0115	145000	4000	2.87 E-6
1.1732	0.0120	149000	4000	3.01 E-6
1.1850	0.0118	153000	4000	2.94 E-6
1.1964	0.0115	157000	4000	2.87 E-6
1.2090	0.0126	161000	4000	3.15 E-6
1.2208	0.0118	165000	4000	2.94 E-6

TABLE 142 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	3.64 E-6	0.0018	500
2	6.07 E-7	0.0127	16000
3	1.06 E-6	0.0351	43500
4	1.34 E-6	0.0518	58500
5	1.75 E-6	0.0587	63000
6	1.61 E-6	0.0654	67000
7	1.75 E-6	0.0722	71000
8	1.75 E-6	0.0792	75000
9	2.31 E-6	0.0873	79000
10	2.31 E-6	0.0965	83000
11	2.52 E-6	0.1062	87000
12	2.52 E-6	0.1163	91000
13	2.59 E-6	0.1265	95000
14	2.45 E-6	0.1366	99000
15	2.59 E-6	0.1466	103000
16	2.87 E-6	0.1576	107000
17	3.01 E-6	0.1693	111000
18	2.94 E-6	0.1812	115000
19	2.87 E-6	0.1928	119000
20	3.15 E-6	0.2049	123000
21	2.94 E-6	0.2171	127000

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0036	1000
2	0.0218	31000
3	0.0484	56000
4	0.0552	61000
5	0.0622	65000
6	0.0687	69000
7	0.0757	73000
8	0.0827	77000
9	0.0919	81000
10	0.1011	85000
11	0.1112	89000
12	0.1213	93000
13	0.1317	97000
14	0.1415	101000
15	0.1518	105000
16	0.1633	109000
17	0.1753	113000
18	0.1871	117000
19	0.1986	121000
20	0.2112	125000
21	0.2229	129000

TABLE 143

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 2-L-3, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.3$ ,  $U_c=-2$ ,  $S=3.5$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.0416	0.0045	322750	1000	4.48 E-6
1.0550	0.0134	362750	40000	3.36 E-7
1.0612	0.0062	402750	40000	1.54 E-7
1.0696	0.0084	442750	40000	2.10 E-7
1.0763	0.0067	462750	20000	3.36 E-7
1.0830	0.0067	482750	20000	3.36 E-7
1.0942	0.0112	502750	20000	5.60 E-7
1.1099	0.0157	522750	20000	7.84 E-7
1.1357	0.0258	542750	20000	1.29 E-6
1.1525	0.0168	552750	10000	1.68 E-6
1.1693	0.0168	560750	8000	2.10 E-6
1.1950	0.0258	568750	8000	3.22 E-6
1.2006	0.0056	574750	6000	9.33 E-7
1.2107	0.0101	578750	4000	2.52 E-6
1.2208	0.0101	582750	4000	2.52 E-6
1.2309	0.0101	586750	4000	2.52 E-6
1.2410	0.0101	590750	4000	2.52 E-6
1.2449	0.0039	592750	2000	1.96 E-6
1.2510	0.0062	594750	2000	3.08 E-6
1.2555	0.0045	596750	2000	2.24 E-6
1.2617	0.0062	598750	2000	3.08 E-6
1.2662	0.0045	600750	2000	2.24 E-6
1.2723	0.0062	602750	2000	3.08 E-6
1.2779	0.0056	604750	2000	2.80 E-6
1.2846	0.0067	606750	2000	3.36 E-6
1.2908	0.0062	608750	2000	3.08 E-6
1.2964	0.0056	610750	2000	2.80 E-6
1.3037	0.0073	612750	2000	3.64 E-6
1.3093	0.0056	614750	2000	2.80 E-6

TABLE 143 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	4.48 E-6	0.0022	500
2	3.36 E-7	0.0112	21000
3	1.54 E-7	0.0210	61000
4	2.10 E-7	0.0283	101000
5	3.36 E-7	0.0358	131000
6	3.36 E-7	0.0426	151000
7	5.60 E-7	0.0515	171000
8	7.84 E-7	0.0650	191000
9	1.29 E-6	0.0857	211000
10	1.68 E-6	0.1070	226000
11	2.10 E-6	0.1238	235000
12	3.22 E-6	0.1450	243000
13	9.33 E-7	0.1607	250000
14	2.52 E-6	0.1686	255000
15	2.52 E-6	0.1786	259000
16	2.52 E-6	0.1887	263000
17	2.52 E-6	0.1988	267000
18	1.96 E-6	0.2058	270000
19	3.08 E-6	0.2108	272000
20	2.24 E-6	0.2162	274000
21	3.08 E-6	0.2215	276000
22	2.24 E-6	0.2268	278000
23	3.08 E-6	0.2321	280000
24	2.80 E-6	0.2380	282000
25	3.36 E-6	0.2442	284000
26	3.08 E-6	0.2506	286000
27	2.80 E-6	0.2565	288000
28	3.64 E-6	0.2629	290000
29	2.80 E-6	0.2694	292000

TABLE 143 (continued)

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0045	1000
2	0.0179	41000
3	0.0241	81000
4	0.0325	121000
5	0.0392	141000
6	0.0459	161000
7	0.0571	181000
8	0.0728	201000
9	0.0986	221000
10	0.1154	231000
11	0.1322	239000
12	0.1579	247000
13	0.1635	253000
14	0.1736	257000
15	0.1837	261000
16	0.1938	265000
17	0.2038	269000
18	0.2078	271000
19	0.2139	273000
20	0.2184	275000
21	0.2246	277000
22	0.2290	279000
23	0.2352	281000
24	0.2408	283000
25	0.2475	285000
26	0.2537	287000
27	0.2593	289000
28	0.2666	291000
29	0.2722	293000

Data adjusted to reflect growth of one crack tip.

(338)

TABLE 144

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 6-L-15, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.5$ ,  $U_c=-1.0$ ,  $S=3.5$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.3423	0.0020	6000	1000	2.00 E-6
1.3541	0.0118	26000	20000	5.88 E-7
1.3597	0.0056	46000	20000	2.80 E-7
1.3698	0.0101	66000	20000	5.04 E-7
1.3821	0.0123	86000	20000	6.16 E-7
1.3877	0.0056	96000	10000	5.60 E-7
1.3944	0.0067	106000	10000	6.72 E-7
1.4045	0.0101	116000	10000	1.01 E-6
1.4112	0.0067	126000	10000	6.72 E-7
1.4151	0.0039	130000	4000	9.80 E-7
1.4162	0.0011	134000	4000	2.80 E-7
1.4224	0.0062	138000	4000	1.54 E-6
1.4269	0.0045	142000	4000	1.12 E-6
1.4302	0.0034	146000	4000	8.40 E-7
1.4342	0.0039	150000	4000	9.80 E-7
1.4392	0.0050	154000	4000	1.26 E-6
1.4437	0.0045	158000	4000	1.12 E-6
1.4493	0.0056	162000	4000	1.40 E-6
1.4538	0.0045	166000	4000	1.12 E-6
1.4605	0.0067	170000	4000	1.68 E-6
1.4661	0.0056	174000	4000	1.40 E-6
1.4706	0.0045	178000	4000	1.12 E-6
1.4750	0.0045	182000	4000	1.12 E-6



TABLE 144 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	2.00 E-6	0.0010	500
2	5.88 E-7	0.0079	11000
3	2.80 E-7	0.0166	31000
4	5.04 E-7	0.0244	51000
5	6.16 E-7	0.0356	71000
6	5.60 E-7	0.0446	86000
7	6.72 E-7	0.0507	96000
8	1.01 E-6	0.0591	106000
9	6.72 E-7	0.0675	116000
10	9.80 E-7	0.0728	123000
11	2.80 E-7	0.0754	127000
12	1.54 E-6	0.0790	131000
13	1.12 E-6	0.0843	135000
14	8.40 E-7	0.0882	139000
15	9.80 E-7	0.0919	143000
16	1.26 E-6	0.0964	147000
17	1.12 E-6	0.1011	151000
18	1.40 E-6	0.1062	155000
19	1.12 E-6	0.1112	159000
20	1.68 E-6	0.1168	163000
21	1.40 E-6	0.1230	167000
22	1.12 E-6	0.1280	171000
23	1.12 E-6	0.1325	175000

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0020	1000
2	0.0138	21000
3	0.0194	41000
4	0.0294	61000
5	0.0418	81000
6	0.0474	91000
7	0.0541	101000
8	0.0642	111000
9	0.0709	121000
10	0.0748	125000
11	0.0759	129000
12	0.0821	133000
13	0.0866	137000
14	0.0899	141000
15	0.0938	145000
16	0.0989	149000
17	0.1034	153000
18	0.1090	157000
19	0.1134	161000
20	0.1202	165000
21	0.1258	169000
22	0.1302	173000
23	0.1347	177000

Data adjusted to reflect growth of one crack tip.

TABLE 145

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
TEMPERATURE DESICCATED AIR

SPECIMEN NO. 2-L-3, TENSION-COMPRESSION

F=12Hz,  $K_2=10$ , R=0.5,  $U_c = -2$ , S=3.5

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.3625	0.0031	6000	1000	3.08 E-6
1.3748	0.0124	86000	80000	1.54 E-7
1.3824	0.0075	166000	80000	9.45 E-8
1.3896	0.0072	246000	80000	8.85 E-8
1.4000	0.0104	312000	66000	1.58 E-7
1.4179	0.0179	372000	60000	2.98 E-7
1.4308	0.0130	404000	32000	4.03 E-7
1.4462	0.0154	436000	32000	4.82 E-7
1.4664	0.0200	468000	32000	6.25 E-7
1.4874	0.0210	500000	32000	6.56 E-7
1.5173	0.0230	532000	32000	7.71 E-7
1.5456	0.0283	564000	32000	8.84 E-7
1.5627	0.0171	580000	16000	1.06 E-6
1.5803	0.0176	596000	16000	1.10 E-6
1.5982	0.0180	612000	16000	1.12 E-6
1.6156	0.0174	628000	16000	1.08 E-6
1.6226	0.0070	636000	8000	8.75 E-7
1.6324	0.0098	644000	8000	1.22 E-6
1.6391	0.0067	652000	8000	8.40 E-7
1.6481	0.0090	660000	8000	1.12 E-6
1.6565	0.0084	668000	8000	1.05 E-6
1.6652	0.0087	676000	8000	1.09 E-6
1.6741	0.0090	684000	8000	1.12 E-6
1.6825	0.0084	692000	8000	1.05 E-6
1.6890	0.0064	700000	8000	8.05 E-7
1.6985	0.0095	708000	8000	1.19 E-6
1.7083	0.0098	716000	8000	1.22 E-6
1.7170	0.0087	724000	8000	1.09 E-6
1.7251	0.0081	732000	8000	1.02 E-6

TABLE 145 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	3.08 E-6	0.0015	500
2	1.54 E-7	0.0093	41000
3	9.45 E-8	0.0192	121000
4	8.85 E-8	0.0266	201000
5	1.58 E-7	0.0354	274000
6	2.98 E-7	0.0495	337000
7	4.03 E-7	0.0650	383000
8	4.82 E-7	0.0792	415000
9	6.25 E-7	0.0969	447000
10	6.56 E-7	0.1174	479000
11	7.71 E-7	0.1394	511000
12	8.84 E-7	0.1650	543000
13	1.06 E-6	0.1877	567000
14	1.10 E-6	0.2051	583000
15	1.12 E-6	0.2229	599000
16	1.08 E-6	0.2406	615000
17	8.75 E-7	0.2528	627000
18	1.22 E-6	0.2612	635000
19	8.40 E-7	0.2694	643000
20	1.12 E-6	0.2773	651000
21	1.05 E-6	0.2860	659000
22	1.09 E-6	0.2945	667000
23	1.12 E-6	0.3034	675000
24	1.05 E-6	0.3121	683000
25	8.05 E-7	0.3195	691000
26	1.19 E-6	0.3274	699000
27	1.22 E-6	0.3371	707000
28	1.09 E-6	0.3463	715000
29	1.02 E-6	0.3547	723000

TABLE 145 (continued)

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0031	1000
2	0.0155	81000
3	0.0230	161000
4	0.0302	241000
5	0.0406	307000
6	0.0585	367000
7	0.0715	399000
8	0.0869	431000
9	0.1069	463000
10	0.1279	495000
11	0.1509	527000
12	0.1792	559000
13	0.1963	575000
14	0.2139	591000
15	0.2319	607000
16	0.2493	623000
17	0.2563	631000
18	0.2661	639000
19	0.2728	647000
20	0.2818	655000
21	0.2902	663000
22	0.2989	671000
23	0.3079	679000
24	0.3163	687000
25	0.3227	695000
26	0.3322	703000
27	0.3420	711000
28	0.3507	719000
29	0.3588	727000

TABLE 146

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 2-L-17, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.1$ ,  $U_c=-1$ ,  $S=4.0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.5827	0.0106	65000	1000	1.06 E-5
0.6112	0.0286	90000	25000	1.14 E-6
0.6493	0.0381	115000	25000	1.52 E-6
0.6709	0.0216	125000	10000	2.16 E-6
0.6810	0.0101	129000	4000	2.52 E-6
0.6908	0.0098	133000	4000	2.45 E-6
0.7022	0.0115	137000	4000	2.87 E-6
0.7154	0.0132	141000	4000	3.29 E-6
0.7283	0.0129	145000	4000	3.22 E-6
0.7403	0.0120	149000	4000	3.01 E-6
0.7543	0.0140	153000	4000	3.50 E-6
0.7697	0.0154	157000	4000	3.85 E-6
0.7862	0.0165	161000	4000	4.13 E-6
0.8019	0.0157	165000	4000	3.92 E-6
0.8190	0.0171	169000	4000	4.27 E-6
0.8361	0.0171	173000	4000	4.27 E-6

TABLE 146 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	1.06 E-5	0.0053	500
2	1.14 E-6	0.0249	13500
3	1.52 E-6	0.0582	38500
4	2.16 E-6	0.0881	56000
5	2.52 E-6	0.1039	63000
6	2.45 E-6	0.1138	67000
7	2.87 E-6	0.1245	71000
8	3.29 E-6	0.1368	75000
9	3.22 E-6	0.1498	79000
10	3.01 E-6	0.1623	83000
11	3.50 E-6	0.1753	87000
12	3.85 E-6	0.1900	91000
13	4.13 E-6	0.2059	95000
14	3.92 E-6	0.2220	99000
15	4.27 E-6	0.2384	103000
16	4.27 E-6	0.2555	107000

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0106	1000
2	0.0392	26000
3	0.0773	51000
4	0.0988	61000
5	0.1089	65000
6	0.1187	69000
7	0.1302	73000
8	0.1434	77000
9	0.1562	81000
10	0.1683	85000
11	0.1823	89000
12	0.1977	93000
13	0.2142	97000
14	0.2299	101000
15	0.2470	105000
16	0.2640	109000

TABLE 147

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 1-L-5, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.1$ ,  $U_c = -2$ ,  $S=4.0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.5421	0.0084	3000	1000	8.40 E-6
0.5729	0.0308	43000	40000	7.70 E-7
0.5891	0.0162	70500	27500	5.91 E-7
0.6070	0.0179	90750	20250	8.85 E-7
0.6334	0.0263	110750	20000	1.32 E-6
0.6378	0.0045	114750	4000	1.12 E-6
0.6457	0.0078	118750	4000	1.96 E-6
0.6513	0.0056	122750	4000	1.40 E-6
0.6608	0.0095	126750	4000	2.38 E-6
0.6698	0.0090	130750	4000	2.24 E-6
0.6770	0.0073	134750	4000	1.82 E-6
0.6854	0.0084	138750	4000	2.10 E-6
0.6950	0.0095	142750	4000	2.38 E-6
0.7056	0.0106	146750	4000	2.66 E-6
0.7174	0.0118	150750	4000	2.94 E-6
0.7280	0.0106	154750	4000	2.66 E-6
0.7386	0.0106	158750	4000	2.66 E-6
0.7521	0.0134	162750	4000	3.36 E-6
0.7672	0.0151	166750	4000	3.78 E-6
0.7806	0.0134	170750	4000	3.36 E-6
0.7946	0.0140	174750	4000	3.50 E-6
0.8109	0.0162	178750	4000	4.06 E-6
0.8277	0.0168	182750	4000	4.20 E-6
0.8450	0.0174	186750	4000	4.34 E-6
0.8635	0.0185	190750	4000	4.62 E-6
0.8814	0.0179	194750	4000	4.48 E-6
0.8994	0.0179	198750	4000	4.48 E-6
0.9178	0.0185	202750	4000	4.62 E-6
0.9363	0.0185	206750	4000	4.62 E-6

TABLE 147 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	8.40 E-6	0.0042	500
2	7.70 E-7	0.0238	21000
3	5.91 E-7	0.0473	54750
4	8.85 E-7	0.0644	78625
5	1.32 E-6	0.0865	98750
6	1.12 E-6	0.1019	110750
7	1.96 E-6	0.1081	114750
8	1.40 E-6	0.1148	118750
9	2.38 E-6	0.1224	122750
10	2.24 E-6	0.1316	126750
11	1.82 E-6	0.1397	130750
12	2.10 E-6	0.1476	134750
13	2.38 E-6	0.1565	138750
14	2.66 E-6	0.1666	142750
15	2.94 E-6	0.1778	146750
16	2.66 E-6	0.1890	150750
17	2.66 E-6	0.1996	154750
18	3.36 E-6	0.2117	158750
19	3.78 E-6	0.2260	162750
20	3.36 E-6	0.2402	166750
21	3.50 E-6	0.2540	170750
22	4.06 E-6	0.2691	174750
23	4.20 E-6	0.2856	178750
24	4.34 E-6	0.3027	182750
25	4.62 E-6	0.3206	186750
26	4.48 E-6	0.3388	190750
27	4.48 E-6	0.3567	194750
28	4.62 E-6	0.3749	198750
29	4.62 E-6	0.3934	202750



TABLE 147 (continued)

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0084	1000
2	0.0392	41000
3	0.0554	68500
4	0.0734	88750
5	0.0997	108750
6	0.1042	112750
7	0.1120	116750
8	0.1176	120750
9	0.1271	124750
10	0.1361	128750
11	0.1434	132750
12	0.1518	136750
13	0.1613	140750
14	0.1719	144750
15	0.1837	148750
16	0.1943	152750
17	0.2050	156750
18	0.2184	160750
19	0.2335	164750
20	0.2470	168750
21	0.2610	172750
22	0.2772	176750
23	0.2940	180750
24	0.3114	184750
25	0.3298	188750
26	0.3478	192750
27	0.3657	196750
28	0.3842	200750
29	0.4026	204750

TABLE 148

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 5-L-21, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.3$ ,  $U_c=-1$ ,  $S=4.0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.0942	0.0034	4000	1000	3.40 E-6
1.1138	0.0196	29000	25000	7.84 E-7
1.1245	0.0106	54000	25000	4.26 E-7
1.1413	0.0168	79000	25000	6.72 E-7
1.1704	0.0291	104000	25000	1.16 E-6
1.1850	0.0146	114000	10000	1.46 E-6
1.1917	0.0067	118000	4000	1.68 E-6
1.1995	0.0078	122000	4000	1.96 E-6
1.2051	0.0056	126000	4000	1.40 E-6
1.2141	0.0090	130000	4000	2.24 E-6
1.2219	0.0078	134000	4000	1.96 E-6
1.2320	0.0101	138000	4000	2.52 E-6
1.2404	0.0084	142000	4000	2.10 E-6
1.2510	0.0106	146000	4000	2.66 E-6
1.2617	0.0106	150000	4000	2.66 E-6
1.2729	0.0112	154000	4000	2.80 E-6
1.2863	0.0134	158000	4000	3.36 E-6
1.2975	0.0112	162000	4000	2.80 E-6
1.3082	0.0106	166000	4000	2.66 E-6
1.3210	0.0129	170000	4000	3.22 E-6
1.3328	0.0118	174000	4000	2.94 E-6
1.3462	0.0134	178000	4000	3.36 E-6
1.3580	0.0118	182000	4000	2.94 E-6
1.3709	0.0129	186000	4000	3.22 E-6
1.3838	0.0129	190000	4000	3.22 E-6

TABLE 148 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	3.40 E-6	0.0017	500
2	7.84 E-7	0.0132	13500
3	4.26 E-7	0.0283	38500
4	6.72 E-7	0.0420	63500
5	1.16 E-6	0.0650	88500
6	1.46 E-6	0.0868	106000
7	1.68 E-6	0.0975	113000
8	1.96 E-6	0.1048	117000
9	1.40 E-6	0.1115	121000
10	2.24 E-6	0.1188	125000
11	1.96 E-6	0.1272	129000
12	2.52 E-6	0.1361	133000
13	2.10 E-6	0.1454	137000
14	2.66 E-6	0.1549	141000
15	2.66 E-6	0.1655	145000
16	2.80 E-6	0.1764	149000
17	3.36 E-6	0.1888	153000
18	2.80 E-6	0.2011	157000
19	2.66 E-6	0.2120	161000
20	3.22 E-6	0.2238	165000
21	2.94 E-6	0.2361	169000
22	3.36 E-6	0.2487	173000
23	2.94 E-6	0.2613	177000
24	3.22 E-6	0.2736	181000
25	3.22 E-6	0.2865	185000

TABLE 148 (continued)

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0034	1000
2	0.0230	26000
3	0.0336	51000
4	0.0504	76000
5	0.0796	101000
6	0.0941	111000
7	0.1008	115000
8	0.1087	119000
9	0.1143	123000
10	0.1232	127000
11	0.1311	131000
12	0.1412	135000
13	0.1496	139000
14	0.1602	143000
15	0.1708	147000
16	0.1820	151000
17	0.1955	155000
18	0.2067	159000
19	0.2173	163000
20	0.2302	167000
21	0.2420	171000
22	0.2554	175000
23	0.2672	179000
24	0.2800	183000
25	0.2929	187000

Data adjusted to reflect growth of one crack tip.

TABLE 149

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 5-L-21, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.3$ ,  $U_c = -2$ ,  $S=4.0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.4437	0.0073	1000	1000	7.28 E-6
1.4560	0.0123	51000	50000	2.46 E-7
1.4666	0.0106	151000	100000	1.06 E-7
1.4722	0.0056	251000	100000	5.60 E-8
1.4784	0.0062	336000	85000	7.25 E-8
1.4851	0.0067	396000	60000	1.12 E-7
1.4918	0.0067	446000	50000	1.34 E-7
1.5019	0.0101	496000	50000	2.02 E-7
1.5165	0.0146	546000	50000	2.91 E-7
1.5450	0.0286	596000	50000	5.71 E-7
1.5708	0.0258	621000	25000	1.03 E-6
1.5826	0.0118	631000	10000	1.18 E-6
1.5982	0.0157	641000	10000	1.57 E-6
1.6128	0.0146	651000	10000	1.46 E-6
1.6341	0.0213	661000	10000	2.13 E-6
1.6559	0.0218	671000	10000	2.18 E-6
1.6811	0.0252	681000	10000	2.52 E-6
1.7091	0.0280	691000	10000	2.80 E-6
1.7405	0.0314	702250	11250	2.79 E-6
1.7707	0.0302	712250	10000	3.02 E-6
1.7998	0.0291	722250	10000	2.91 E-6
1.8323	0.0325	732250	10000	3.25 E-6
1.8620	0.0297	742250	10000	2.97 E-6
1.8939	0.0319	752250	10000	3.19 E-6

TABLE 149 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	7.28 E-6	0.0036	500
2	2.46 E-7	0.0134	26000
3	1.06 E-7	0.0249	101000
4	5.60 E-8	0.0330	201000
5	7.25 E-8	0.0389	293500
6	1.12 E-7	0.0454	366000
7	1.34 E-7	0.0521	421000
8	2.02 E-7	0.0605	471000
9	2.91 E-7	0.0728	521000
10	5.71 E-7	0.0944	571000
11	1.03 E-6	0.1215	608500
12	1.18 E-6	0.1403	626000
13	1.57 E-6	0.1540	636000
14	1.46 E-6	0.1691	646000
15	2.13 E-6	0.1870	656000
16	2.18 E-6	0.2086	666000
17	2.52 E-6	0.2321	676000
18	2.80 E-6	0.2587	686000
19	2.79 E-6	0.2884	696625
20	3.02 E-6	0.3192	707250
21	2.91 E-6	0.3489	717250
22	3.25 E-6	0.3797	727250
23	2.97 E-6	0.4108	737250
24	3.19 E-6	0.4416	747250

TABLE 149 (continued)

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0073	1000
2	0.0196	51000
3	0.0302	151000
4	0.0358	251000
5	0.0420	336000
6	0.0487	396000
7	0.0554	446000
8	0.0655	496000
9	0.0801	546000
10	0.1086	596000
11	0.1344	621000
12	0.1462	631000
13	0.1618	641000
14	0.1764	651000
15	0.1977	661000
16	0.2195	671000
17	0.2447	681000
18	0.2727	691000
19	0.3041	702250
20	0.3343	712250
21	0.3634	722250
22	0.3959	732250
23	0.4256	742250
24	0.4575	752250

Data adjusted to reflect growth of one crack tip.

TABLE 150

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 5-L-21, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.5$ ,  $U_c=-1$ ,  $S=4.0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.7510	0.0017	78500	1250	1.34 E-6
0.7664	0.0154	103500	25000	6.16 E-7
0.7753	0.0090	128500	25000	3.58 E-7
0.7829	0.0076	153500	25000	3.02 E-7
0.7907	0.0078	178500	25000	3.14 E-7
0.8014	0.0106	203500	25000	4.26 E-7
0.8142	0.0129	228500	25000	5.15 E-7
0.8198	0.0056	238500	10000	5.60 E-7
0.8277	0.0078	248500	10000	7.84 E-7
0.8344	0.0067	258500	10000	6.72 E-7
0.8422	0.0078	268500	10000	7.84 E-7
0.8506	0.0084	278500	10000	8.40 E-7
0.8590	0.0084	288500	10000	8.40 E-7
0.8674	0.0084	298500	10000	8.40 E-7
0.8775	0.0101	308500	10000	1.01 E-6
0.8865	0.0090	318500	10000	8.96 E-7
0.8971	0.0106	328500	10000	1.06 E-6
0.9089	0.0118	338500	10000	1.18 E-6
0.9212	0.0123	348500	10000	1.23 E-6
0.9338	0.0126	358500	10000	1.26 E-6
0.9456	0.0118	368500	10000	1.18 E-6
0.9582	0.0126	378500	10000	1.26 E-6
0.9705	0.0123	388500	10000	1.23 E-6
0.9822	0.0118	398500	10000	1.18 E-6
0.9968	0.0146	408500	10000	1.46 E-6
1.0091	0.0123	418500	10000	1.23 E-6
1.0231	0.0140	428500	10000	1.40 E-6
1.0371	0.0140	438500	10000	1.40 E-6
1.0492	0.0120	448500	10000	1.20 E-6



TABLE 150 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	1.34 E-6	0.0008	625
2	6.16 E-7	0.0094	13750
3	3.58 E-7	0.0216	38750
4	3.02 E-7	0.0298	63750
5	3.14 E-7	0.0375	88750
6	4.26 E-7	0.0468	113750
7	5.15 E-7	0.0585	138750
8	5.60 E-7	0.0678	156250
9	7.84 E-7	0.0745	166250
10	6.72 E-7	0.0818	176250
11	7.84 E-7	0.0890	186250
12	8.40 E-7	0.0972	196250
13	8.40 E-7	0.1056	206250
14	8.40 E-7	0.1140	216250
15	1.01 E-6	0.1232	226250
16	8.96 E-7	0.1327	236250
17	1.06 E-6	0.1425	246250
18	1.18 E-6	0.1537	256250
19	1.23 E-6	0.1658	266250
20	1.26 E-6	0.1782	276250
21	1.18 E-6	0.1904	286250
22	1.26 E-6	0.2026	296250
23	1.23 E-6	0.2150	306250
24	1.18 E-6	0.2271	316250
25	1.46 E-6	0.2402	326250
26	1.23 E-6	0.2537	336250
27	1.40 E-6	0.2668	346250
28	1.40 E-6	0.2808	356250
29	1.20 E-6	0.2939	366250

TABLE 150 (continued)

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0017	1250
2	0.0171	26250
3	0.0260	51250
4	0.0336	76250
5	0.0414	101250
6	0.0521	126250
7	0.0650	151250
8	0.0706	161250
9	0.0784	171250
10	0.0851	181250
11	0.0930	191250
12	0.1014	201250
13	0.1098	211250
14	0.1182	221250
15	0.1282	231250
16	0.1372	241250
17	0.1478	251250
18	0.1596	261250
19	0.1719	271250
20	0.1845	281250
21	0.1963	291250
22	0.2089	301250
23	0.2212	311250
24	0.2330	321250
25	0.2475	331250
26	0.2598	341250
27	0.2738	351250
28	0.2878	361250
29	0.2999	371250

TABLE 151

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 2-L-6, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.5$ ,  $U_c=-2$ ,  $S=4.0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.4818	0.0056	16000	2000	2.80 E-6
1.4885	0.0067	41000	25000	2.69 E-7
1.4963	0.0078	91000	50000	1.57 E-7
1.5053	0.0090	191000	100000	8.96 E-8
1.5064	0.0011	291000	100000	1.12 E-8
1.5114	0.0050	391000	100000	5.04 E-8
1.5187	0.0073	491000	100000	7.28 E-8
1.5243	0.0056	591000	100000	5.60 E-8
1.5327	0.0084	691000	100000	8.40 E-8
1.5411	0.0084	791000	100000	8.40 E-8
1.5512	0.0101	891000	100000	1.01 E-7
1.5646	0.0134	991000	100000	1.34 E-7
1.5803	0.0157	1091000	100000	1.57 E-7
1.5926	0.0123	1141000	50000	2.46 E-7
1.6083	0.0157	1191000	50000	3.14 E-7
1.6240	0.0157	1241000	50000	3.14 E-7
1.6475	0.0235	1291000	50000	4.70 E-7
1.6800	0.0325	1341000	50000	6.50 E-7
1.6979	0.0179	1366000	25000	7.17 E-7
1.7214	0.0235	1391000	25000	9.41 E-7
1.7472	0.0258	1416000	25000	1.03 E-6
1.7601	0.0129	1428500	12500	1.03 E-6
1.7662	0.0062	1433500	5000	1.23 E-6
1.7752	0.0090	1442000	8500	1.05 E-6
1.7825	0.0073	1447000	5000	1.46 E-6
1.7881	0.0056	1452000	5000	1.12 E-6
1.7937	0.0056	1457000	5000	1.12 E-6
1.8004	0.0067	1462000	5000	1.34 E-6
1.8066	0.0062	1467000	5000	1.23 E-6

TABLE 151 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	2.80 E-6	0.0028	1000
2	2.69 E-7	0.0090	14500
3	1.57 E-7	0.0162	52000
4	8.96 E-8	0.0246	127000
5	1.12 E-8	0.0297	227000
6	5.04 E-8	0.0328	327000
7	7.28 E-8	0.0389	427000
8	5.60 E-8	0.0454	527000
9	8.40 E-8	0.0524	627000
10	8.40 E-8	0.0608	727000
11	1.01 E-7	0.0700	827000
12	1.34 E-7	0.0818	927000
13	1.57 E-7	0.0963	1027000
14	2.46 E-7	0.1103	1102000
15	3.14 E-7	0.1243	1152000
16	3.14 E-7	0.1400	1202000
17	4.70 E-7	0.1596	1252000
18	6.50 E-7	0.1876	1302000
19	7.17 E-7	0.2128	1339500
20	9.41 E-7	0.2335	1364500
21	1.03 E-6	0.2582	1389500
22	1.03 E-6	0.2775	1408250
23	1.23 E-6	0.2870	1417000
24	1.05 E-6	0.2946	1423750
25	1.46 E-6	0.3027	1430500
26	1.12 E-6	0.3091	1435500
27	1.12 E-6	0.3147	1440500
28	1.34 E-6	0.3209	1445500
29	1.23 E-6	0.3273	1450500

TABLE 151 (continued)

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0056	2000
2	0.0123	27000
3	0.0202	77000
4	0.0291	177000
5	0.0302	277000
6	0.0353	377000
7	0.0426	477000
8	0.0482	577000
9	0.0566	677000
10	0.0650	777000
11	0.0750	877000
12	0.0885	977000
13	0.1042	1077000
14	0.1165	1127000
15	0.1322	1177000
16	0.1478	1227000
17	0.1714	1277000
18	0.2038	1327000
19	0.2218	1352000
20	0.2453	1377000
21	0.2710	1402000
22	0.2839	1414500
23	0.2901	1419500
24	0.2990	1428000
25	0.3063	1433000
26	0.3119	1438000
27	0.3175	1443000
28	0.3242	1448000
29	0.3304	1453000

Data adjusted to reflect growth of one crack tip.

Data Tabulations for Tension-Compression Load  
Class,  $K_2=7.78$  and  $14 \text{ KSI} \sqrt{\text{In.}}$

TABLE 152

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 6-L-21, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K2=7.78$ ,  $R=0.1$ ,  $U_c = -1.0$   $S=1.5$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.7090	0.0011	6000	1000	1.12 E-6
0.7115	0.0025	8000	2000	1.26 E-6
0.7146	0.0031	10000	2000	1.54 E-6
0.7179	0.0034	12000	2000	1.68 E-6
0.7227	0.0048	14000	2000	2.38 E-6
0.7269	0.0042	16000	2000	2.10 E-6
0.7302	0.0034	18000	2000	1.68 E-6
0.7336	0.0034	20000	2000	1.68 E-6
0.7389	0.0053	22000	2000	2.66 E-6
0.7437	0.0048	24000	2000	2.38 E-6
0.7476	0.0039	26000	2000	1.96 E-6
0.7507	0.0031	28000	2000	1.54 E-6
RUN NO. 2				
0.7515	0.0008	29000	1000	8.40 E-7
0.7554	0.0039	31000	2000	1.96 E-6
0.7582	0.0028	33000	2000	1.40 E-6
0.7619	0.0036	35000	2000	1.82 E-6
0.7658	0.0039	37000	2000	1.96 E-6
0.7697	0.0039	39000	2000	1.96 E-6
0.7731	0.0034	41000	2000	1.68 E-6
0.7759	0.0028	43000	2000	1.40 E-6
0.7801	0.0042	45000	2000	2.10 E-6
0.7848	0.0048	47000	2000	2.38 E-6
0.7885	0.0036	49000	2000	1.82 E-6
0.7918	0.0034	51000	2000	1.68 E-6
RUN NO. 3				
0.7927	0.0008	52000	1000	8.40 E-7
0.7949	0.0022	54000	2000	1.12 E-6
0.7972	0.0022	56000	2000	1.12 E-6
0.8002	0.0031	58000	2000	1.54 E-6
0.8044	0.0042	60000	2000	2.10 E-6
0.8084	0.0039	62000	2000	1.96 E-6
0.8126	0.0042	64000	2000	2.10 E-6
0.8165	0.0039	66000	2000	1.96 E-6
0.8210	0.0045	68000	2000	2.24 E-6
0.8254	0.0045	70000	2000	2.24 E-6
0.8285	0.0031	72000	2000	1.54 E-6
0.8330	0.0045	74000	2000	2.24 E-6

TABLE 152 (continued)

RUN NO. 4

0.8338	0.0008	75000	1000	8.40 E-7
0.8364	0.0025	77000	2000	1.26 E-6
0.8403	0.0039	79000	2000	1.96 E-6
0.8436	0.0034	81000	2000	1.68 E-6
0.8470	0.0034	83000	2000	1.68 E-6
0.8504	0.0034	85000	2000	1.68 E-6
0.8537	0.0034	87000	2000	1.68 E-6
0.8585	0.0048	89000	2000	2.38 E-6
0.8616	0.0031	91000	2000	1.54 E-6
0.8649	0.0034	93000	2000	1.68 E-6
0.8683	0.0034	95000	2000	1.68 E-6
0.8725	0.0042	97000	2000	2.10 E-6

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	9.10 E-7	0.0005	500
2	1.40 E-6	0.0023	2000
3	1.51 E-6	0.0052	4000
4	1.68 E-6	0.0084	6000
5	2.03 E-6	0.0121	8000
6	1.93 E-6	0.0161	10000
7	1.79 E-6	0.0198	12000
8	1.86 E-6	0.0234	14000
9	2.13 E-6	0.0274	16000
10	2.17 E-6	0.0317	18000
11	1.75 E-6	0.0356	20000
12	1.89 E-6	0.0393	22000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0009	1000
2	0.0037	3000
3	0.0067	5000
4	0.0101	7000
5	0.0141	9000
6	0.0180	11000
7	0.0216	13000
8	0.0253	15000
9	0.0295	17000
10	0.0339	19000
11	0.0374	21000
12	0.0412	23000

(363)



TABLE 153

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 6-L-21, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K2=7.78$ ,  $R=0.1$ ,  $U_c = -2.0$ ,  $S=1.5$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.0898	0.0025	8000	2000	1.26 E-6
1.0926	0.0028	10000	2000	1.40 E-6
1.0959	0.0034	12000	2000	1.68 E-6
1.0987	0.0028	14000	2000	1.40 E-6
1.1021	0.0034	16000	2000	1.68 E-6
1.1049	0.0028	18000	2000	1.40 E-6
1.1088	0.0039	20000	2000	1.96 E-6
1.1124	0.0036	22000	2000	1.82 E-6
1.1158	0.0034	24000	2000	1.68 E-6
1.1194	0.0036	26000	2000	1.82 E-6
1.1239	0.0045	28000	2000	2.24 E-6
1.1273	0.0034	30000	2000	1.68 E-6
1.1306	0.0034	32000	2000	1.68 E-6
1.1334	0.0028	34000	2000	1.40 E-6
RUN NO. 2				
1.1348	0.0014	36000	2000	7.00 E-7
1.1379	0.0031	38000	2000	1.54 E-6
1.1413	0.0034	40000	2000	1.68 E-6
1.1438	0.0025	42000	2000	1.26 E-6
1.1480	0.0042	44000	2000	2.10 E-6
1.1514	0.0034	46000	2000	1.68 E-6
1.1561	0.0048	48000	2000	2.30 E-6
1.1592	0.0031	50000	2000	1.54 E-6
1.1628	0.0036	52000	2000	1.82 E-6
1.1656	0.0028	54000	2000	1.40 E-6
1.1693	0.0036	56000	2000	1.82 E-6
1.1726	0.0034	58000	2000	1.68 E-6
1.1768	0.0042	60000	2000	2.10 E-6
1.1796	0.0028	62000	2000	1.40 E-6

TABLE 153 (continued)

RUN NO. 3

1.1816	0.0020	64000	2000	9.80 E-7
1.1836	0.0020	66000	2000	9.80 E-7
1.1861	0.0025	68000	2000	1.26 E-6
1.1889	0.0028	70000	2000	1.40 E-6
1.1928	0.0039	72000	2000	1.96 E-6
1.1967	0.0039	74000	2000	1.96 E-6
1.1998	0.0031	76000	2000	1.54 E-6
1.2026	0.0028	78000	2000	1.40 E-6
1.2068	0.0042	80000	2000	2.10 E-6
1.2096	0.0028	82000	2000	1.40 E-6
1.2127	0.0031	84000	2000	1.54 E-6
1.2160	0.0034	86000	2000	1.68 E-6
1.2191	0.0031	88000	2000	1.54 E-6
1.2222	0.0031	90000	2000	1.54 E-6

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	9.80 E-7	0.0010	1000
2	1.31 E-6	0.0033	3000
3	1.54 E-6	0.0061	5000
4	1.35 E-6	0.0090	7000
5	1.91 E-6	0.0123	9000
6	1.68 E-6	0.0159	11000
7	1.96 E-6	0.0195	13000
8	1.59 E-6	0.0231	15000
9	1.87 E-6	0.0265	17000
10	1.54 E-6	0.0299	19000
11	1.87 E-6	0.0333	21000
12	1.68 E-6	0.0369	23000
13	1.77 E-6	0.0403	25000
14	1.45 E-6	0.0435	27000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0020	2000
2	0.0046	4000
3	0.0077	6000
4	0.0104	8000
5	0.0142	10000
6	0.0175	12000
7	0.0215	14000
8	0.0246	16000
9	0.0284	18000
10	0.0315	20000
11	0.0352	22000
12	0.0385	24000
13	0.0421	26000
14	0.0450	28000

(365)

TABLE 154

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 5-L-20, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=7.78$ ,  $R=0.1$ ,  $U_c = -1.0$ ,  $S=2.0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.2051	0.0025	11000	1000	2.52 E-6
1.2076	0.0025	15000	4000	6.30 E-7
1.2093	0.0017	17000	2000	8.40 E-7
1.2113	0.0020	19000	2000	9.80 E-7
1.2135	0.0022	21000	2000	1.12 E-6
1.2177	0.0042	23000	2000	2.10 E-6
1.2216	0.0039	25000	2000	1.96 E-6
1.2261	0.0045	27000	2000	2.24 E-6
1.2306	0.0045	29000	2000	2.24 E-6
1.2337	0.0031	31000	2000	1.54 E-6
1.2384	0.0048	33000	2000	2.38 E-6
1.2432	0.0048	35000	2000	2.38 E-6
RUN NO. 2				
1.2446	0.0014	36000	1000	1.40 E-6
1.2466	0.0020	40000	4000	4.90 E-7
1.2471	0.0006	42000	2000	2.80 E-7
1.2508	0.0036	44000	2000	1.82 E-6
1.2527	0.0020	46000	2000	9.80 E-7
1.2552	0.0025	48000	2000	1.26 E-6
1.2594	0.0042	50000	2000	2.10 E-6
1.2634	0.0039	52000	2000	1.96 E-6
1.2667	0.0034	54000	2000	1.68 E-6
1.2715	0.0048	56000	2000	2.38 E-6
1.2754	0.0039	58000	2000	1.96 E-6
1.2790	0.0036	60000	2000	1.82 E-6
RUN NO. 3				
1.2816	0.0025	61000	1000	2.52 E-6
1.2841	0.0025	65000	4000	6.30 E-7
1.2863	0.0022	67000	2000	1.12 E-6
1.2883	0.0020	69000	2000	9.80 E-7
1.2914	0.0031	71000	2000	1.54 E-6
1.2947	0.0034	73000	2000	1.68 E-6
1.2986	0.0039	75000	2000	1.96 E-6
1.3028	0.0042	77000	2000	2.10 E-6
1.3059	0.0031	79000	2000	1.54 E-6
1.3104	0.0045	81000	2000	2.24 E-6
1.3146	0.0042	83000	2000	2.10 E-6
1.3180	0.0034	85000	2000	1.68 E-6

TABLE 154 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	2.15 E-6	0.0011	500
2	5.83 E-7	0.0033	3000
3	7.47 E-7	0.0052	6000
4	1.26 E-6	0.0072	8000
5	1.21 E-6	0.0097	10000
6	1.68 E-6	0.0126	12000
7	2.01 E-6	0.0163	14000
8	2.10 E-6	0.0204	16000
9	1.82 E-6	0.0243	18000
10	2.05 E-6	0.0282	20000
11	2.15 E-6	0.0324	22000
12	1.96 E-6	0.0365	24000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0021	1000
2	0.0045	5000
3	0.0060	7000
4	0.0085	9000
5	0.0109	11000
6	0.0143	13000
7	0.0183	15000
8	0.0225	17000
9	0.0261	19000
10	0.0302	21000
11	0.0345	23000
12	0.0385	25000

TABLE 155

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 5-L-20, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=7.78$ ,  $R=0.1$ ,  $U_c=-2.0$ ,  $S=2.0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.0158	0.0014	32000	1000	1.40 E-6
1.0172	0.0014	36000	4000	3.50 E-7
1.0195	0.0022	40000	4000	5.60 E-7
1.0214	0.0020	42000	2000	9.80 E-7
1.0240	0.0025	44000	2000	1.26 E-6
1.0265	0.0025	46000	2000	1.26 E-6
1.0307	0.0042	48000	2000	2.10 E-6
1.0349	0.0042	50000	2000	2.10 E-6
1.0391	0.0042	52000	2000	2.10 E-6
1.0436	0.0045	54000	2000	2.24 E-6
1.0475	0.0039	56000	2000	1.96 E-6
1.0503	0.0028	58000	2000	1.40 E-6
1.0542	0.0039	60000	2000	1.96 E-6
1.0587	0.0045	62000	2000	2.24 E-6
1.0626	0.0039	64000	2000	1.96 E-6
RUN NO. 2				
1.0646	0.0020	65000	1000	1.96 E-6
1.0665	0.0020	69000	4000	4.90 E-7
1.0693	0.0028	73000	4000	7.00 E-7
1.0710	0.0017	75000	2000	8.40 E-7
1.0738	0.0028	77000	2000	1.40 E-6
1.0766	0.0028	79000	2000	1.40 E-6
1.0802	0.0036	81000	2000	1.82 E-6
1.0833	0.0031	83000	2000	1.54 E-6
1.0875	0.0042	85000	2000	2.10 E-6
1.0914	0.0039	87000	2000	1.96 E-6
1.0956	0.0042	89000	2000	2.10 E-6
1.0993	0.0036	91000	2000	1.82 E-6
1.1021	0.0028	93000	2000	1.40 E-6
1.1057	0.0036	95000	2000	1.82 E-6
1.1091	0.0034	97000	2000	1.68 E-6

TABLE 155 (continued)

RUN NO. 3

1.1183	0.0022	102000	1000	2.24 E-6
1.1194	0.0011	106000	4000	2.80 E-7
1.1225	0.0031	110000	4000	7.70 E-7
1.1239	0.0014	112000	2000	7.00 E-7
1.1259	0.0020	114000	2000	9.80 E-7
1.1292	0.0034	116000	2000	1.68 E-6
1.1334	0.0042	118000	2000	2.10 E-6
1.1374	0.0039	120000	2000	1.96 E-6
1.1424	0.0050	122000	2000	2.52 E-6
1.1466	0.0042	124000	2000	2.10 E-6
1.1500	0.0034	126000	2000	1.68 E-6
1.1539	0.0039	128000	2000	1.96 E-6
1.1584	0.0045	130000	2000	2.24 E-6
1.1614	0.0031	132000	2000	1.54 E-6
1.1651	0.0036	134000	2000	1.82 E-6

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	1.87 E-6	0.0009	500
2	3.73 E-7	0.0026	3000
3	6.77 E-7	0.0047	7000
4	8.40 E-7	0.0069	10000
5	1.21 E-6	0.0090	12000
6	1.45 E-6	0.0116	14000
7	2.01 E-6	0.0151	16000
8	1.87 E-6	0.0189	18000
9	2.24 E-6	0.0231	20000
10	2.10 E-6	0.0274	22000
11	1.91 E-6	0.0314	24000
12	1.73 E-6	0.0350	26000
13	1.87 E-6	0.0386	28000
14	1.87 E-6	0.0424	30000
15	1.82 E-6	0.0461	32000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0019	1000
2	0.0034	5000
3	0.0061	9000
4	0.0077	11000
5	0.0102	13000
6	0.0131	15000
7	0.0171	17000
8	0.0208	19000
9	0.0253	21000
10	0.0295	23000
11	0.0333	25000
12	0.0368	27000
13	0.0405	29000
14	0.0442	31000
15	0.0479	33000

(369)

TABLE 156

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 3-L-15, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=7.78$ ,  $R=0.1$ ,  $U_c=-1.0$ ,  $S=2.5$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.8394	0.0017	17000	1000	1.68 E-6
0.8417	0.0022	21000	4000	5.60 E-7
0.8422	0.0006	25000	4000	1.40 E-7
0.8445	0.0022	29000	4000	5.60 E-7
0.8456	0.0011	31000	2000	5.60 E-7
0.8473	0.0017	33000	2000	8.40 E-7
0.8481	0.0008	35000	2000	4.20 E-7
0.8498	0.0017	37000	2000	8.40 E-7
0.8523	0.0025	39000	2000	1.26 E-6
0.8560	0.0036	41000	2000	1.82 E-6
0.8585	0.0025	43000	2000	1.26 E-6
0.8613	0.0028	45000	2000	1.40 E-6
0.8646	0.0034	47000	2000	1.68 E-6
0.8691	0.0045	49000	2000	2.24 E-6
0.8725	0.0034	51000	2000	1.68 E-6
0.8764	0.0039	53000	2000	1.96 E-6
0.8803	0.0039	55000	2000	1.96 E-6
0.8845	0.0042	57000	2000	2.10 E-6
RUN NO. 2				
0.8870	0.0025	58000	1000	2.52 E-6
0.8893	0.0022	62000	4000	5.60 E-7
0.8910	0.0017	66000	4000	4.20 E-7
0.8921	0.0011	70000	4000	2.80 E-7
0.8926	0.0006	72000	2000	2.80 E-7
0.8932	0.0006	74000	2000	2.80 E-7
0.8943	0.0011	76000	2000	5.60 E-7
0.8960	0.0017	78000	2000	8.40 E-7
0.8982	0.0022	80000	2000	1.12 E-6
0.9002	0.0020	82000	2000	9.80 E-7
0.9027	0.0025	84000	2000	1.26 E-6
0.9058	0.0031	86000	2000	1.54 E-6
0.9092	0.0034	88000	2000	1.68 E-6
0.9120	0.0028	90000	2000	1.40 E-6
0.9153	0.0034	92000	2000	1.68 E-6
0.9192	0.0039	94000	2000	1.96 E-6
0.9237	0.0045	96000	2000	2.24 E-6
0.9271	0.0034	98000	2000	1.68 E-6

TABLE 156 (continued)

RUN NO. 3

0.9554	0.0022	113000	1000	2.24 E-6
0.9570	0.0017	117000	4000	4.20 E-7
0.9582	0.0011	121000	4000	2.80 E-7
0.9593	0.0011	125000	4000	2.80 E-7
0.9607	0.0014	127000	2000	7.00 E-7
0.9621	0.0014	129000	2000	7.00 E-7
0.9633	0.0012	131000	2000	6.16 E-7
0.9649	0.0016	133000	2000	7.84 E-7
0.9663	0.0014	135000	2000	7.00 E-7
0.9682	0.0020	137000	2000	9.80 E-7
0.9716	0.0034	139000	2000	1.68 E-6
0.9744	0.0028	141000	2000	1.40 E-6
0.9778	0.0034	143000	2000	1.68 E-6
0.9811	0.0034	145000	2000	1.68 E-6
0.9850	0.0039	147000	2000	1.96 E-6
0.9887	0.0036	149000	2000	1.82 E-6
0.9926	0.0039	151000	2000	1.96 E-6
0.9968	0.0042	153000	2000	2.10 E-6



TABLE 156 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	2.15 E-6	0.0011	500
2	5.13 E-7	0.0032	3000
3	2.80 E-7	0.0048	7000
4	3.73 E-7	0.0061	11000
5	5.13 E-7	0.0073	14000
6	6.07 E-7	0.0084	16000
7	5.32 E-7	0.0096	18000
8	8.21 E-7	0.0109	20000
9	1.03 E-6	0.0128	22000
10	1.26 E-6	0.0151	24000
11	1.40 E-6	0.0177	26000
12	1.45 E-6	0.0206	28000
13	1.68 E-6	0.0237	30000
14	1.77 E-6	0.0272	32000
15	1.77 E-6	0.0307	34000
16	1.91 E-6	0.0344	36000
17	2.05 E-6	0.0384	38000
18	1.96 E-6	0.0424	40000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0021	1000
2	0.0042	5000
3	0.0053	9000
4	0.0068	13000
5	0.0078	15000
6	0.0091	17000
7	0.0101	19000
8	0.0118	21000
9	0.0138	23000
10	0.0163	25000
11	0.0191	27000
12	0.0220	29000
13	0.0254	31000
14	0.0289	33000
15	0.0325	35000
16	0.0363	37000
17	0.0404	39000
18	0.0443	41000

TABLE 157

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 3-L-15, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=7.78$ ,  $R=0.1$ ,  $U_c=-2$ ,  $S=2.5$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.0119	0.0025	7000	1000	2.52 E-6
1.0147	0.0028	15000	8000	3.50 E-7
1.0172	0.0024	23000	8000	3.15 E-7
1.0192	0.0020	31000	8000	2.45 E-7
1.0214	0.0022	35000	4000	5.60 E-7
1.0231	0.0017	37000	2000	8.40 E-7
1.0248	0.0017	39000	2000	8.40 E-7
1.0276	0.0028	41000	2000	1.40 E-6
1.0298	0.0022	43000	2000	1.12 E-6
1.0329	0.0031	45000	2000	1.54 E-6
1.0363	0.0034	47000	2000	1.68 E-6
1.0391	0.0028	49000	2000	1.40 E-6
1.0419	0.0028	51000	2000	1.40 E-6
1.0458	0.0039	53000	2000	1.96 E-6
1.0506	0.0048	55000	2000	2.38 E-6
1.0553	0.0048	57000	2000	2.38 E-6
1.0590	0.0036	59000	2000	1.82 E-6
1.0637	0.0048	61000	2000	2.38 E-6
1.0676	0.0039	63000	2000	1.96 E-6
1.0713	0.0036	65000	2000	1.82 E-6
RUN NO. 2				
1.0738	0.0025	66000	1000	2.52 E-6
1.0763	0.0025	74000	8000	3.15 E-7
1.0783	0.0020	82000	8000	2.45 E-7
1.0808	0.0025	90000	8000	3.15 E-7
1.0830	0.0022	94000	4000	5.60 E-7
1.0844	0.0014	96000	2000	7.00 E-7
1.0858	0.0014	98000	2000	7.00 E-7
1.0872	0.0014	100000	2000	7.00 E-7
1.0898	0.0025	102000	2000	1.26 E-6
1.0937	0.0039	104000	2000	1.96 E-6
1.0982	0.0045	106000	2000	2.24 E-6
1.1004	0.0022	108000	2000	1.12 E-6
1.1038	0.0034	110000	2000	1.68 E-6
1.1082	0.0045	112000	2000	2.24 E-6
1.1127	0.0045	114000	2000	2.24 E-6
1.1172	0.0045	116000	2000	2.24 E-6
1.1217	0.0045	118000	2000	2.24 E-6
1.1262	0.0045	120000	2000	2.24 E-6
1.1295	0.0034	122000	2000	1.68 E-6
1.1337	0.0042	124000	2000	2.10 E-6

TABLE 157 (continued)

RUN NO. 3

1.1362	0.0025	125000	1000	2.52 E-6
1.1379	0.0017	133000	8000	2.10 E-7
1.1393	0.0014	141000	8000	1.75 E-7
1.1427	0.0034	149000	8000	4.20 E-7
1.1455	0.0028	153000	4000	7.00 E-7
1.1463	0.0008	155000	2000	4.20 E-7
1.1483	0.0020	157000	2000	9.80 E-7
1.1500	0.0017	159000	2000	8.40 E-7
1.1522	0.0022	161000	2000	1.12 E-6
1.1556	0.0034	163000	2000	1.68 E-6
1.1584	0.0028	165000	2000	1.40 E-6
1.1620	0.0036	167000	2000	1.82 E-6
1.1659	0.0039	169000	2000	1.96 E-6
1.1696	0.0036	171000	2000	1.82 E-6
1.1743	0.0048	173000	2000	2.38 E-6
1.1788	0.0045	175000	2000	2.24 E-6
1.1838	0.0050	177000	2000	2.52 E-6
1.1889	0.0050	179000	2000	2.52 E-6
1.1922	0.0034	181000	2000	1.68 E-6
1.1956	0.0034	183000	2000	1.68 E-6

TABLE 157 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	2.52 E-6	0.0013	500
2	2.92 E-7	0.0037	5000
3	2.45 E-7	0.0058	13000
4	3.27 E-7	0.0081	21000
5	6.07 E-7	0.0106	27000
6	6.53 E-7	0.0125	30000
7	8.40 E-7	0.0140	32000
8	9.80 E-7	0.0158	34000
9	1.17 E-6	0.0179	36000
10	1.73 E-6	0.0208	38000
11	1.77 E-6	0.0243	40000
12	1.45 E-6	0.0275	42000
13	1.68 E-6	0.0307	44000
14	2.01 E-6	0.0344	46000
15	2.33 E-6	0.0387	48000
16	2.29 E-6	0.0433	50000
17	2.19 E-6	0.0478	52000
18	2.38 E-6	0.0524	54000
19	1.77 E-6	0.0565	56000
20	1.87 E-6	0.0602	58000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0025	1000
2	0.0049	9000
3	0.0068	17000
4	0.0094	25000
5	0.0118	29000
6	0.0131	31000
7	0.0148	33000
8	0.0168	35000
9	0.0191	37000
10	0.0226	39000
11	0.0261	41000
12	0.0290	43000
13	0.0324	45000
14	0.0364	47000
15	0.0410	49000
16	0.0456	51000
17	0.0500	53000
18	0.0548	55000
19	0.0583	57000
20	0.0620	59000

TABLE 158

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 2-L-19, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=7.78$ ,  $R=0.1$ ,  $U_c=-1$ ,  $S=3.0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.4556	0.0020	5000	1000	1.96 E-6
0.4620	0.0064	15000	10000	6.44 E-7
0.4693	0.0073	25000	10000	7.28 E-7
0.4760	0.0067	30000	5000	1.34 E-6
0.4819	0.0059	33000	3000	1.96 E-6
0.4872	0.0053	36000	3000	1.77 E-6
0.4925	0.0053	39000	3000	1.77 E-6
0.4981	0.0056	42000	3000	1.87 E-6
0.5037	0.0056	45000	3000	1.87 E-6
0.5102	0.0064	48000	3000	2.15 E-6
0.5158	0.0056	51000	3000	1.87 E-6
0.5219	0.0062	54000	3000	2.05 E-6
0.5286	0.0067	57000	3000	2.24 E-6
0.5351	0.0064	60000	3000	2.15 E-6
0.5410	0.0059	63000	3000	1.96 E-6
0.5471	0.0062	66000	3000	2.05 E-6
0.5533	0.0062	69000	3000	2.05 E-6
RUN NO. 2				
0.5911	0.0036	85000	1000	3.64 E-6
0.5958	0.0048	95000	10000	4.76 E-7
0.6014	0.0056	105000	10000	5.60 E-7
0.6062	0.0048	110000	5000	9.52 E-7
0.6087	0.0025	113000	3000	8.40 E-7
0.6143	0.0056	116000	3000	1.87 E-6
0.6182	0.0039	119000	3000	1.31 E-6
0.6244	0.0062	122000	3000	2.05 E-6
0.6286	0.0042	125000	3000	1.40 E-6
0.6345	0.0059	128000	3000	1.96 E-6
0.6401	0.0056	131000	3000	1.87 E-6
0.6465	0.0064	134000	3000	2.15 E-6
0.6521	0.0056	137000	3000	1.87 E-6
0.6583	0.0062	140000	3000	2.05 E-6
0.6658	0.0076	143000	3000	2.52 E-6
0.6720	0.0062	146000	3000	2.05 E-6
0.6779	0.0059	149000	3000	1.96 E-6

TABLE 158 (cont'd)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	2.80 E-6	0.0014	500
2	5.60 E-7	0.0056	6000
3	6.44 E-7	0.0116	16000
4	1.15 E-6	0.0177	23500
5	1.40 E-6	0.0227	27500
6	1.82 E-6	0.0275	30500
7	1.54 E-6	0.0326	33500
8	1.96 E-6	0.0378	36500
9	1.63 E-6	0.0432	39500
10	2.05 E-6	0.0487	42500
11	1.87 E-6	0.0546	45500
12	2.10 E-6	0.0606	48500
13	2.05 E-6	0.0668	51500
14	2.10 E-6	0.0730	54500
15	2.24 E-6	0.0795	57500
16	2.05 E-6	0.0860	60500
17	2.01 E-6	0.0921	63500

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0028	1000
2	0.0084	11000
3	0.0148	21000
4	0.0206	26000
5	0.0248	29000
6	0.0302	32000
7	0.0349	35000
8	0.0407	38000
9	0.0456	41000
10	0.0518	44000
11	0.0574	47000
12	0.0637	50000
13	0.0699	53000
14	0.0762	56000
15	0.0829	59000
16	0.0890	62000
17	0.0951	65000

TABLE 159

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 4-L-21, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=7.78$ ,  $R=0.1$ ,  $U_c=-2.0$ ,  $S=3.0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.3353	0.0014	1000	1000	1.40 E-6
1.3401	0.0048	21000	20000	2.38 E-7
1.3434	0.0034	41000	20000	1.68 E-7
1.3457	0.0022	51000	10000	2.24 E-7
1.3507	0.0050	61000	10000	5.04 E-7
1.3552	0.0045	66000	5000	8.96 E-7
1.3572	0.0020	69000	3000	6.53 E-7
1.3608	0.0036	72000	3000	1.21 E-6
1.3639	0.0031	75000	3000	1.03 E-6
1.3667	0.0028	78000	3000	9.33 E-7
1.3692	0.0025	81000	3000	8.40 E-7
1.3723	0.0031	84000	3000	1.03 E-6
1.3754	0.0031	87000	3000	1.03 E-6
1.3787	0.0034	90000	3000	1.12 E-6
1.3826	0.0039	93000	3000	1.31 E-6
1.3868	0.0042	96000	3000	1.40 E-6
1.3902	0.0034	99000	3000	1.12 E-6
1.3950	0.0048	102000	3000	1.59 E-6
1.4000	0.0050	105000	3000	1.68 E-6
1.4056	0.0056	108000	3000	1.87 E-6
1.4095	0.0039	111000	3000	1.31 E-6
1.4143	0.0048	114000	3000	1.59 E-6
1.4193	0.0050	117000	3000	1.68 E-6
1.4249	0.0056	120000	3000	1.87 E-6
1.4305	0.0056	123000	3000	1.87 E-6
1.4361	0.0056	126000	3000	1.87 E-6
1.4417	0.0056	129000	3000	1.87 E-6
1.4468	0.0050	132000	3000	1.68 E-6
1.4510	0.0042	135000	3000	1.40 E-6

TABLE 159 (cont'd)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	1.40 E-6	0.0007	500
2	2.38 E-7	0.0038	11000
3	1.68 E-7	0.0078	31000
4	2.24 E-7	0.0106	46000
5	5.04 E-7	0.0143	56000
6	8.96 E-7	0.0190	63500
7	6.53 E-7	0.0223	67500
8	1.21 E-6	0.0251	70500
9	1.03 E-6	0.0284	73500
10	9.33 E-7	0.0314	76500
11	8.40 E-7	0.0340	79500
12	1.03 E-6	0.0368	82500
13	1.03 E-6	0.0399	85500
14	1.12 E-6	0.0431	88500
15	1.31 E-6	0.0468	91500
16	1.40 E-6	0.0508	94500
17	1.12 E-6	0.0546	97500
18	1.59 E-6	0.0587	100500
19	1.68 E-6	0.0636	103500
20	1.87 E-6	0.0689	106500
21	1.31 E-6	0.0736	109500
22	1.59 E-6	0.0780	112500
23	1.68 E-6	0.0829	115500
24	1.87 E-6	0.0882	118500
25	1.87 E-6	0.0938	121500
26	1.87 E-6	0.0994	124500
27	1.87 E-6	0.1050	127500
28	1.68 E-6	0.1103	130500
29	1.40 E-6	0.1149	133500



TABLE 159 (cont'd)

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0014	1000
2	0.0062	21000
3	0.0095	41000
4	0.0118	51000
5	0.0168	61000
6	0.0213	66000
7	0.0232	69000
8	0.0269	72000
9	0.0300	75000
10	0.0328	78000
11	0.0353	81000
12	0.0384	84000
13	0.0414	87000
14	0.0448	90000
15	0.0487	93000
16	0.0529	96000
17	0.0563	99000
18	0.0610	102000
19	0.0661	105000
20	0.0717	108000
21	0.0756	111000
22	0.0804	114000
23	0.0854	117000
24	0.0910	120000
25	0.0966	123000
26	0.1022	126000
27	0.1078	129000
28	0.1128	132000
29	0.1170	135000

TABLE 160

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 2-L-19, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=7.78$ ,  $R=0.1$ ,  $U_c=-1$ ,  $S=3.5$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.2093	0.0025	2000	1000	2.52 E-6
1.2152	0.0059	27000	25000	2.35 E-7
1.2186	0.0034	52000	25000	1.34 E-7
1.2242	0.0056	77000	25000	2.24 E-7
1.2300	0.0059	87000	10000	5.88 E-7
1.2337	0.0036	92000	5000	7.28 E-7
1.2365	0.0028	95000	3000	9.33 E-7
1.2390	0.0025	98000	3000	8.40 E-7
1.2418	0.0028	101000	3000	9.33 E-7
1.2460	0.0042	104000	3000	1.40 E-6
1.2508	0.0048	107000	3000	1.59 E-6
1.2558	0.0050	110000	3000	1.68 E-6
1.2600	0.0042	113000	3000	1.40 E-6
1.2648	0.0048	116000	3000	1.59 E-6
1.2690	0.0042	119000	3000	1.40 E-6
1.2740	0.0050	122000	3000	1.68 E-6
1.2793	0.0053	125000	3000	1.77 E-6
1.2835	0.0042	128000	3000	1.40 E-6
1.2886	0.0050	131000	3000	1.68 E-6
1.2942	0.0056	134000	3000	1.87 E-6
1.2995	0.0053	137000	3000	1.77 E-6
1.3059	0.0064	140000	3000	2.15 E-6
1.3110	0.0050	143000	3000	1.68 E-6

TABLE 160 (cont'd)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	2.52 E-6	0.0013	500
2	2.35 E-7	0.0055	13500
3	1.34 E-7	0.0101	38500
4	2.24 E-7	0.0146	63500
5	5.88 E-7	0.0203	81000
6	7.28 E-7	0.0251	88500
7	9.33 E-7	0.0283	92500
8	8.40 E-7	0.0309	95500
9	9.33 E-7	0.0336	98500
10	1.40 E-6	0.0371	101500
11	1.59 E-6	0.0416	104500
12	1.68 E-6	0.0465	107500
13	1.40 E-6	0.0511	110500
14	1.59 E-6	0.0556	113500
15	1.40 E-6	0.0601	116500
16	1.68 E-6	0.0647	119500
17	1.77 E-6	0.0699	122500
18	1.40 E-6	0.0746	125500
19	1.68 E-6	0.0792	128500
20	1.87 E-6	0.0846	131500
21	1.77 E-6	0.0900	134500
22	2.15 E-6	0.0959	137500
23	1.68 E-6	0.1016	140500

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0025	1000
2	0.0084	26000
3	0.0118	51000
4	0.0174	76000
5	0.0232	86000
6	0.0269	91000
7	0.0297	94000
8	0.0322	97000
9	0.0350	100000
10	0.0392	103000
11	0.0440	106000
12	0.0490	109000
13	0.0532	112000
14	0.0580	115000
15	0.0622	118000
16	0.0672	121000
17	0.0725	124000
18	0.0767	127000
19	0.0818	130000
20	0.0874	133000
21	0.0927	136000
22	0.0991	139000
23	0.1042	142000

TABLE 161  
EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
TEMPERATURE DESICCATED AIR  
SPECIMEN NO. 2-L-16, TENSION-COMPRESSION  
F=12Hz,  $K_2=7.78$ , R=0.1,  $U_0=-2$ , S=3.5

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.2236	0.0045	9000	1000	4.48 E-6
1.2286	0.0050	29000	20000	2.52 E-7
1.2309	0.0022	49000	20000	1.12 E-7
1.2320	0.0011	69000	20000	5.60 E-8
1.2370	0.0050	89000	20000	2.52 E-7
1.2421	0.0050	109000	20000	2.52 E-7
1.2555	0.0134	129000	20000	6.72 E-7
1.2611	0.0056	134000	5000	1.12 E-6
1.2656	0.0045	138000	4000	1.12 E-6
1.2701	0.0045	142000	4000	1.12 E-6
1.2746	0.0045	146000	4000	1.12 E-6
1.2802	0.0056	150000	4000	1.40 E-6
1.2869	0.0067	154000	4000	1.68 E-6
1.2914	0.0045	158000	4000	1.12 E-6
1.2981	0.0067	162000	4000	1.68 E-6
1.3042	0.0062	166000	4000	1.54 E-6
1.3098	0.0056	170000	4000	1.40 E-6
1.3160	0.0062	174000	4000	1.54 E-6
1.3227	0.0067	178000	4000	1.68 E-6
1.3317	0.0090	182000	4000	2.24 E-6
1.3384	0.0067	186000	4000	1.68 E-6
1.3440	0.0056	190000	4000	1.40 E-6
1.3518	0.0078	194000	4000	1.96 E-6
1.3597	0.0078	198000	4000	1.96 E-6
1.3686	0.0090	202000	4000	2.24 E-6
1.3770	0.0084	206000	4000	2.10 E-6
1.3860	0.0090	210000	4000	2.24 E-6
1.3944	0.0084	214000	4000	2.10 E-6

TABLE 161(continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	4.48 E-6	0.0022	500
2	2.52 E-7	0.0070	11000
3	1.12 E-7	0.0106	31000
4	5.60 E-8	0.0123	51000
5	2.52 E-7	0.0154	71000
6	2.52 E-7	0.0204	91000
7	6.72 E-7	0.0297	111000
8	1.12 E-6	0.0392	123500
9	1.12 E-6	0.0442	128000
10	1.12 E-6	0.0487	132000
11	1.12 E-6	0.0532	136000
12	1.40 E-6	0.0582	140000
13	1.68 E-6	0.0644	144000
14	1.12 E-6	0.0700	148000
15	1.68 E-6	0.0756	152000
16	1.54 E-6	0.0820	156000
17	1.40 E-6	0.0879	160000
18	1.54 E-6	0.0938	164000
19	1.68 E-6	0.1002	168000
20	2.24 E-6	0.1081	172000
21	1.68 E-6	0.1159	176000
22	1.40 E-6	0.1221	180000
23	1.96 E-6	0.1288	184000
24	1.96 E-6	0.1366	188000
25	2.24 E-6	0.1450	192000
26	2.10 E-6	0.1537	196000
27	2.24 E-6	0.1624	200000
28	2.10 E-6	0.1711	204000

TABLE 161 (continued)

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0045	1000
2	0.0095	21000
3	0.0118	41000
4	0.0129	61000
5	0.0179	81000
6	0.0230	101000
7	0.0364	121000
8	0.0420	126000
9	0.0465	130000
10	0.0510	134000
11	0.0554	138000
12	0.0610	142000
13	0.0678	146000
14	0.0722	150000
15	0.0790	154000
16	0.0851	158000
17	0.0907	162000
18	0.0969	166000
19	0.1036	170000
20	0.1126	174000
21	0.1193	178000
22	0.1249	182000
23	0.1327	186000
24	0.1406	190000
25	0.1495	194000
26	0.1579	198000
27	0.1669	202000
28	0.1753	206000

Data for one crack tip.

TABLE 162

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 2-L-19, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=7.78$ ,  $R=0.1$ ,  $U_c=-1$ ,  $S=4.0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.5674	0.0045	2000	1000	4.50 E-6
1.5708	0.0034	27000	25000	1.34 E-7
1.5736	0.0028	52000	25000	1.12 E-7
1.5758	0.0022	77000	25000	8.96 E-8
1.5781	0.0022	102000	25000	8.96 E-8
1.5792	0.0011	127000	25000	4.48 E-8
1.5820	0.0028	152000	25000	1.12 E-7
1.5837	0.0017	177000	25000	6.72 E-8
1.5859	0.0022	202000	25000	8.96 E-8
1.5910	0.0050	227000	25000	2.02 E-7
1.6061	0.0151	252000	25000	6.05 E-7
1.6122	0.0062	258000	6000	1.03 E-6
1.6195	0.0073	264000	6000	1.21 E-6
1.6290	0.0095	270000	6000	1.59 E-6
1.6380	0.0090	276000	6000	1.49 E-6
1.6492	0.0112	282000	6000	1.87 E-6
1.6587	0.0095	288000	6000	1.59 E-6
1.6688	0.0101	294000	6000	1.68 E-6
1.6817	0.0129	300000	6000	2.15 E-6
1.6918	0.0101	306000	6000	1.68 E-6
1.7018	0.0101	312000	6000	1.68 E-6
1.7119	0.0101	318000	6000	1.68 E-6
1.7237	0.0118	324000	6000	1.96 E-6
1.7354	0.0118	330000	6000	1.96 E-6
1.7450	0.0095	336000	6000	1.59 E-6
1.7578	0.0129	342000	6000	2.15 E-6
1.7696	0.0118	348000	6000	1.96 E-6
1.7814	0.0118	354000	6000	1.96 E-6
1.7931	0.0118	360000	6000	1.96 E-6

TABLE 162 (cont'd)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	4.50 E-6	0.0023	500
2	1.34 E-7	0.0062	13500
3	1.12 E-7	0.0093	38500
4	8.96 E-8	0.0118	63500
5	8.96 E-8	0.0140	88500
6	4.48 E-8	0.0157	113500
7	1.12 E-7	0.0177	138500
8	6.72 E-8	0.0199	163500
9	8.96 E-8	0.0219	188500
10	2.02 E-7	0.0255	213500
11	6.05 E-7	0.0356	238500
12	1.03 E-6	0.0462	254000
13	1.21 E-6	0.0529	260000
14	1.59 E-6	0.0613	266000
15	1.49 E-6	0.0706	272000
16	1.87 E-6	0.0807	278000
17	1.59 E-6	0.0910	284000
18	1.68 E-6	0.1008	290000
19	2.15 E-6	0.1123	296000
20	1.68 E-6	0.1238	302000
21	1.68 E-6	0.1339	308000
22	1.68 E-6	0.1439	314000
23	1.96 E-6	0.1549	320000
24	1.96 E-6	0.1666	326000
25	1.59 E-6	0.1773	332000
26	2.15 E-6	0.1885	338000
27	1.96 E-6	0.2008	344000
28	1.96 E-6	0.2125	350000
29	1.96 E-6	0.2243	356000



TABLE 162 (cont'd)

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0045	1000
2	0.0079	26000
3	0.0107	51000
4	0.0129	76000
5	0.0151	101000
6	0.0163	126000
7	0.0191	151000
8	0.0207	176000
9	0.0230	201000
10	0.0280	226000
11	0.0431	251000
12	0.0493	257000
13	0.0566	263000
14	0.0661	269000
15	0.0751	275000
16	0.0863	281000
17	0.0958	287000
18	0.1059	293000
19	0.1187	299000
20	0.1288	305000
21	0.1389	311000
22	0.1490	317000
23	0.1607	323000
24	0.1725	329000
25	0.1820	335000
26	0.1949	341000
27	0.2067	347000
28	0.2184	353000
29	0.2302	359000

Data adjusted to reflect growth of one crack tip.

TABLE 163

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 6-L-1, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=7.78$ ,  $R=0.1$ ,  $U_c=-2$ ,  $S=4.0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.4749	0.0022	5000	1000	2.20 E-6
0.4816	0.0067	30000	25000	2.69 E-7
0.4861	0.0045	55000	25000	1.79 E-7
0.4900	0.0039	80000	25000	1.57 E-7
0.4928	0.0028	105000	25000	1.12 E-7
0.4950	0.0022	130000	25000	8.96 E-8
0.4995	0.0045	155000	25000	1.79 E-7
0.5118	0.0123	180000	25000	4.93 E-7
0.5298	0.0179	205000	25000	7.17 E-7
0.5365	0.0067	211000	6000	1.12 E-6
0.5421	0.0056	217000	6000	9.33 E-7
0.5477	0.0056	223000	6000	9.33 E-7
0.5544	0.0067	229000	6000	1.12 E-6
0.5600	0.0056	235000	6000	9.33 E-7
0.5690	0.0090	241000	6000	1.49 E-6
0.5768	0.0078	247000	6000	1.31 E-6
0.5858	0.0090	253000	6000	1.49 E-6
0.5947	0.0090	259000	6000	1.49 E-6
0.6048	0.0101	265000	6000	1.68 E-6
0.6138	0.0090	271000	6000	1.49 E-6
0.6250	0.0112	277000	6000	1.87 E-6
0.6362	0.0112	283000	6000	1.87 E-6
0.6451	0.0090	289000	6000	1.49 E-6
0.6563	0.0112	295000	6000	1.87 E-6
0.6664	0.0101	301000	6000	1.68 E-6
0.6765	0.0101	307000	6000	1.68 E-6
0.6860	0.0095	313000	6000	1.59 E-6
0.6978	0.0118	319000	6000	1.96 E-6
0.7090	0.0112	325000	6000	1.87 E-6

TABLE 163 (cont'd)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	2.20 E-6	0.0011	500
2	2.69 E-7	0.0056	13500
3	1.79 E-7	0.0112	38500
4	1.57 E-7	0.0154	63500
5	1.12 E-7	0.0187	88500
6	8.96 E-8	0.0212	113500
7	1.79 E-7	0.0246	138500
8	4.93 E-7	0.0330	163500
9	7.17 E-7	0.0481	188500
10	1.12 E-6	0.0604	204000
11	9.33 E-7	0.0666	210000
12	9.33 E-7	0.0722	216000
13	1.12 E-6	0.0784	222000
14	9.33 E-7	0.0845	228000
15	1.49 E-6	0.0918	234000
16	1.31 E-6	0.1002	240000
17	1.49 E-6	0.1086	246000
18	1.49 E-6	0.1176	252000
19	1.68 E-6	0.1271	258000
20	1.49 E-6	0.1366	264000
21	1.87 E-6	0.1467	270000
22	1.87 E-6	0.1579	276000
23	1.49 E-6	0.1680	282000
24	1.87 E-6	0.1780	288000
25	1.68 E-6	0.1887	294000
26	1.68 E-6	0.1988	300000
27	1.59 E-6	0.2086	306000
28	1.96 E-6	0.2192	312000
29	1.87 E-6	0.2307	318000

TABLE 163 (cont'd)

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0022	1000
2	0.0089	26000
3	0.0134	51000
4	0.0173	76000
5	0.0201	101000
6	0.0224	126000
7	0.0268	151000
8	0.0392	176000
9	0.0571	201000
10	0.0638	207000
11	0.0694	213000
12	0.0750	219000
13	0.0817	225000
14	0.0873	231000
15	0.0963	237000
16	0.1041	243000
17	0.1131	249000
18	0.1220	255000
19	0.1321	261000
20	0.1411	267000
21	0.1523	273000
22	0.1635	279000
23	0.1724	285000
24	0.1836	291000
25	0.1937	297000
26	0.2038	303000
27	0.2133	309000
28	0.2251	315000
29	0.2363	321000

Data adjusted to reflect growth of one crack tip.

TABLE 164

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 6-L-1, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=7.78$ ,  $R=0.1$ ,  $U_c = -1$ ,  $S=4.5$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.9559	0.0017	175500	1000	1.68 E-6
0.9632	0.0073	200500	25000	2.91 E-7
0.9688	0.0056	225500	25000	2.24 E-7
0.9688	0.0000	250500	25000	0.00 E+0
0.9727	0.0039	275500	25000	1.57 E-7
0.9744	0.0017	300500	25000	6.72 E-8
0.9766	0.0022	325500	25000	8.96 E-8
0.9789	0.0022	350500	25000	8.96 E-8
0.9817	0.0028	375500	25000	1.12 E-7
0.9822	0.0006	400500	25000	2.24 E-8
0.9845	0.0022	425500	25000	8.96 E-8
0.9862	0.0017	450500	25000	6.72 E-8
0.9890	0.0028	475500	25000	1.12 E-7
0.9923	0.0034	500500	25000	1.34 E-7
0.9968	0.0045	525500	25000	1.79 E-7
1.0024	0.0056	550500	25000	2.24 E-7
1.0102	0.0078	575500	25000	3.14 E-7
1.0282	0.0179	600000	24500	7.31 E-7
1.0528	0.0246	624000	24000	1.03 E-6
1.0696	0.0168	636000	6000	2.80 E-6
1.0797	0.0101	642000	6000	1.68 E-6
1.0898	0.0101	648000	6000	1.68 E-6
1.0965	0.0067	654000	6000	1.12 E-6
1.1066	0.0101	660000	6000	1.68 E-6
1.1155	0.0090	666000	6000	1.49 E-6
1.1278	0.0123	672000	6000	2.05 E-6
1.1385	0.0106	678000	6000	1.77 E-6
1.1502	0.0118	684000	6000	1.96 E-6
1.1614	0.0112	690000	6000	1.87 E-6

TABLE 164 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	1.68 E-6	0.0008	500
2	2.91 E-7	0.0053	13500
3	2.24 E-7	0.0118	38500
4	0.00 E+0	0.0146	63500
5	1.57 E-7	0.0165	88500
6	6.72 E-8	0.0193	113500
7	8.96 E-8	0.0213	138500
8	8.96 E-8	0.0235	163500
9	1.12 E-7	0.0260	188500
10	2.24 E-8	0.0277	213500
11	8.96 E-8	0.0291	238500
12	6.72 E-8	0.0311	263500
13	1.12 E-7	0.0333	288500
14	1.34 E-7	0.0364	313500
15	1.79 E-7	0.0403	338500
16	2.24 E-7	0.0454	363500
17	3.14 E-7	0.0521	388500
18	7.31 E-7	0.0650	413250
19	1.03 E-6	0.0862	437500
20	2.80 E-6	0.1070	452500
21	1.68 E-6	0.1204	458500
22	1.68 E-6	0.1305	464500
23	1.12 E-6	0.1389	470500
24	1.68 E-6	0.1473	476500
25	1.49 E-6	0.1568	482500
26	2.05 E-6	0.1674	488500
27	1.77 E-6	0.1789	494500
28	1.96 E-6	0.1901	500500
29	1.87 E-6	0.2016	506500

TABLE 164 (continued)

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0017	1000
2	0.0090	26000
3	0.0146	51000
4	0.0146	76000
5	0.0185	101000
6	0.0202	126000
7	0.0224	151000
8	0.0246	176000
9	0.0274	201000
10	0.0280	226000
11	0.0302	251000
12	0.0319	276000
13	0.0347	301000
14	0.0381	326000
15	0.0426	351000
16	0.0482	376000
17	0.0560	401000
18	0.0739	425500
19	0.0986	449500
20	0.1154	455500
21	0.1254	461500
22	0.1355	467500
23	0.1422	473500
24	0.1523	479500
25	0.1613	485500
26	0.1736	491500
27	0.1842	497500
28	0.1960	503500
29	0.2072	509500

Data adjusted to reflect growth of one crack tip.

TABLE 165

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 6-L-1, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=7.78$ ,  $R=0.1$ ,  $U_c=-2$ ,  $S=4.5$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.6776	0.0039	4000	1000	3.92 E-6
0.6829	0.0053	29000	25000	2.13 E-7
0.6843	0.0014	54000	25000	5.60 E-8
0.6868	0.0025	79000	25000	1.01 E-7
0.6882	0.0014	104000	25000	5.60 E-8
0.6894	0.0011	129000	25000	4.48 E-8
0.6894	0.0000	154000	25000	0.00 E+0
0.6896	0.0003	179000	25000	1.12 E-8
0.6896	0.0000	204000	25000	0.00 E+0
0.6916	0.0020	229000	25000	7.84 E-8
0.6916	0.0000	254000	25000	0.00 E+0
0.6927	0.0011	279000	25000	4.48 E-8
0.6933	0.0006	304000	25000	2.24 E-8
0.6936	0.0003	329000	25000	1.12 E-8
0.6936	0.0000	354000	25000	0.00 E+0
0.6938	0.0003	379000	25000	1.12 E-8
0.6938	0.0000	404000	25000	0.00 E+0
0.6938	0.0000	429000	25000	0.00 E+0
0.6938	0.0000	454000	25000	0.00 E+0
0.6938	0.0000	479000	25000	0.00 E+0
0.6938	0.0000	504000	25000	0.00 E+0
0.6938	0.0000	529000	25000	0.00 E+0
0.6938	0.0000	554000	25000	0.00 E+0
0.6938	0.0000	579000	25000	0.00 E+0
0.6938	0.0000	604000	25000	0.00 E+0
0.6938	0.0000	629000	25000	0.00 E+0
0.6938	0.0000	654000	25000	0.00 E+0
0.6938	0.0000	679000	25000	0.00 E+0
0.6938	0.0000	704000	25000	0.00 E+0

Both crack tips shut-off.



TABLE 166

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 4-L-7, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=7.78$ ,  $R=0.1$ ,  $U_c = -2$ ,  $S=4.1$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.9240	0.0008	250750	1000	8.40 E-7
0.9296	0.0056	275750	25000	2.24 E-7
0.9296	0.0000	300750	25000	0.00 E+0
0.9296	0.0000	325750	25000	0.00 E+0
0.9302	0.0006	350750	25000	2.24 E-8
0.9304	0.0003	375750	25000	1.12 E-8
0.9304	0.0000	400750	25000	0.00 E+0
0.9304	0.0000	425750	25000	0.00 E+0
0.9304	0.0000	450750	25000	0.00 E+0
0.9304	0.0000	475750	25000	0.00 E+0
0.9304	0.0000	500750	25000	0.00 E+0
0.9304	0.0000	525750	25000	0.00 E+0
0.9304	0.0000	550750	25000	0.00 E+0
0.9304	0.0000	575750	25000	0.00 E+0
0.9304	0.0000	600750	25000	0.00 E+0
0.9304	0.0000	625750	25000	0.00 E+0
0.9304	0.0000	650750	25000	0.00 E+0
0.9304	0.0000	675750	25000	0.00 E+0
0.9304	0.0000	700750	25000	0.00 E+0
0.9307	0.0003	725750	25000	1.12 E-8
0.9307	0.0000	750750	25000	0.00 E+0
0.9307	0.0000	775750	25000	0.00 E+0
0.9307	0.0000	800750	25000	0.00 E+0
0.9307	0.0000	825750	25000	0.00 E+0
0.9307	0.0000	850750	25000	0.00 E+0
0.9307	0.0000	875750	25000	0.00 E+0
0.9307	0.0000	900750	25000	0.00 E+0
0.9307	0.0000	925750	25000	0.00 E+0
0.9307	0.0000	950750	25000	0.00 E+0

$S=4.1$  considered to be overload shut-off ratio for this case.

TABLE 167

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 4-L-7, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=7.78$ ,  $R=0.1$ ,  $U_c=-1$ ,  $S=5.0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.4034	0.0039	21000	1000	3.92 E-6
1.4095	0.0062	46000	25000	2.46 E-7
1.4118	0.0022	71000	25000	8.96 E-8
1.4140	0.0022	96000	25000	8.96 E-8
1.4143	0.0003	121000	25000	1.12 E-8
1.4151	0.0008	146000	25000	3.36 E-8
1.4165	0.0014	171000	25000	5.60 E-8
1.4171	0.0006	196000	25000	2.24 E-8
1.4171	0.0000	221000	25000	0.00 E+0
1.4171	0.0000	246000	25000	0.00 E+0
1.4182	0.0011	271000	25000	4.48 E-8
1.4185	0.0003	296000	25000	1.12 E-8
1.4190	0.0006	321000	25000	2.24 E-8
1.4193	0.0003	346000	25000	1.12 E-8
1.4199	0.0006	371000	25000	2.24 E-8
1.4199	0.0000	396000	25000	0.00 E+0
1.4202	0.0003	421000	25000	1.12 E-8
1.4202	0.0000	446000	25000	0.00 E+0
1.4204	0.0003	471000	25000	1.12 E-8
1.4207	0.0003	496000	25000	1.12 E-8
1.4221	0.0014	521000	25000	5.60 E-8
1.4221	0.0000	546000	25000	0.00 E+0
1.4232	0.0011	571000	25000	4.48 E-8
1.4235	0.0003	596000	25000	1.12 E-8
1.4238	0.0003	621000	25000	1.12 E-8
1.4241	0.0003	646000	25000	1.12 E-8
1.4241	0.0000	671000	25000	0.00 E+0
1.4241	0.0000	696000	25000	0.00 E+0
1.4241	0.0000	721000	25000	0.00 E+0

$S=5.0$  considered to be within 0.1 of overload shut-off ratio.

TABLE 168

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 6-L-20, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K2=14$ ,  $R=0.5$ ,  $U_c = -1.0$ ,  $S=1.5$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.8701	0.0039	14000	1000	3.92 E-6
0.7840	0.0039	15000	1000	3.92 E-6
0.7874	0.0034	16000	1000	3.36 E-6
0.7918	0.0045	17000	1000	4.48 E-6
0.7952	0.0034	18000	1000	3.36 E-6
0.7988	0.0036	19000	1000	3.64 E-6
0.8036	0.0048	20000	1000	4.76 E-6
0.8064	0.0028	21000	1000	2.80 E-6
0.8103	0.0039	22000	1000	3.92 E-6
0.8162	0.0059	23000	1000	5.88 E-6
0.8210	0.0048	24000	1000	4.76 E-6
RUN NO. 2				
0.8644	0.0031	36000	1000	3.08 E-6
0.8674	0.0031	37000	1000	3.08 E-6
0.8716	0.0042	38000	1000	4.20 E-6
0.8744	0.0028	39000	1000	2.80 E-6
0.8784	0.0039	40000	1000	3.92 E-6
0.8820	0.0036	41000	1000	3.64 E-6
0.8856	0.0036	42000	1000	3.64 E-6
0.8893	0.0036	43000	1000	3.64 E-6
0.8932	0.0039	44000	1000	3.92 E-6
0.8974	0.0042	45000	1000	4.20 E-6
0.9013	0.0039	46000	1000	3.92 E-6
RUN NO. 3				
0.9248	0.0042	52000	1000	4.20 E-6
0.9285	0.0036	53000	1000	3.64 E-6
0.9324	0.0039	54000	1000	3.92 E-6
0.9372	0.0048	55000	1000	4.76 E-6
0.9405	0.0034	56000	1000	3.36 E-6
0.9439	0.0034	57000	1000	3.36 E-6
0.9484	0.0045	58000	1000	4.48 E-6
0.9523	0.0039	59000	1000	3.92 E-6
0.9570	0.0048	60000	1000	4.76 E-6
0.9615	0.0045	61000	1000	4.48 E-6
0.9652	0.0036	62000	1000	3.64 E-6

TABLE 168 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	3.73 E-6	0.0019	500
2	3.55 E-6	0.0055	1500
3	3.83 E-6	0.0092	2500
4	4.01 E-6	0.0131	3500
5	3.55 E-6	0.0169	4500
6	3.55 E-6	0.0205	5500
7	4.29 E-6	0.0244	6500
8	3.45 E-6	0.0283	7500
9	4.20 E-6	0.0321	8500
10	4.85 E-6	0.0366	9500
11	4.11 E-6	0.0411	10500

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0037	1000
2	0.0073	2000
3	0.0111	3000
4	0.0151	4000
5	0.0187	5000
6	0.0222	6000
7	0.0265	7000
8	0.0300	8000
9	0.0342	9000
10	0.0390	10000
11	0.0431	11000

TABLE 169

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 6-L-20, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K2=14$ ,  $R=0.5$ ,  $U_c = -2.0$ ,  $S=1.5$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.2163	0.0025	5000	1000	2.52 E-6
1.2194	0.0031	6000	1000	3.08 E-6
1.2228	0.0034	7000	1000	3.36 E-6
1.2261	0.0034	8000	1000	3.36 E-6
1.2303	0.0042	9000	1000	4.20 E-6
1.2342	0.0039	10000	1000	3.92 E-6
1.2376	0.0034	11000	1000	3.36 E-6
1.2421	0.0045	12000	1000	4.48 E-6
1.2466	0.0045	13000	1000	4.48 E-6
1.2505	0.0039	14000	1000	3.92 E-6
1.2550	0.0045	15000	1000	4.48 E-6
1.2597	0.0048	16000	1000	4.76 E-6
1.2639	0.0042	17000	1000	4.20 E-6
RUN NO. 2				
1.2678	0.0039	18000	1000	3.92 E-6
1.2709	0.0031	19000	1000	3.08 E-6
1.2740	0.0031	20000	1000	3.08 E-6
1.2785	0.0045	21000	1000	4.48 E-6
1.2818	0.0034	22000	1000	3.36 E-6
1.2855	0.0036	23000	1000	3.64 E-6
1.2900	0.0045	24000	1000	4.48 E-6
1.2936	0.0036	25000	1000	3.64 E-6
1.2981	0.0045	26000	1000	4.48 E-6
1.3026	0.0045	27000	1000	4.48 E-6
1.3065	0.0039	28000	1000	3.92 E-6
1.3115	0.0050	29000	1000	5.04 E-6
1.3160	0.0045	30000	1000	4.48 E-6
RUN NO. 3				
1.3182	0.0022	31000	1000	2.24 E-6
1.3219	0.0036	32000	1000	3.64 E-6
1.3252	0.0034	33000	1000	3.36 E-6
1.3280	0.0028	34000	1000	2.80 E-6
1.3317	0.0036	35000	1000	3.64 E-6
1.3359	0.0042	36000	1000	4.20 E-6
1.3392	0.0034	37000	1000	3.36 E-6
1.3443	0.0050	38000	1000	5.04 E-6
1.3482	0.0039	39000	1000	3.92 E-6
1.3516	0.0034	40000	1000	3.36 E-6
1.3563	0.0048	41000	1000	4.76 E-6
1.3591	0.0028	42000	1000	2.80 E-6
1.3625	0.0034	(400) 43000	1000	3.36 E-6

TABLE 169 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	2.89 E-6	0.0014	500
2	3.27 E-6	0.0045	1500
3	3.27 E-6	0.0078	2500
4	3.55 E-6	0.0112	3500
5	3.73 E-6	0.0148	4500
6	3.92 E-6	0.0187	5500
7	3.73 E-6	0.0225	6500
8	4.39 E-6	0.0266	7500
9	4.29 E-6	0.0309	8500
10	3.92 E-6	0.0350	9500
11	4.39 E-6	0.0392	10500
12	4.20 E-6	0.0434	11500
13	4.01 E-6	0.0476	12500

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0029	1000
2	0.0062	2000
3	0.0094	3000
4	0.0130	4000
5	0.0167	5000
6	0.0206	6000
7	0.0244	7000
8	0.0287	8000
9	0.0330	9000
10	0.0370	10000
11	0.0413	11000
12	0.0455	12000
13	0.0496	13000

TABLE 170

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 3-L-14, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=14$ ,  $R=0.5$ ,  $U_c=-1$ ,  $S=2.0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.5642	0.0031	24000	1000	3.08 E-6
0.5662	0.0020	25000	1000	1.96 E-6
0.5690	0.0028	26000	1000	2.80 E-6
0.5718	0.0028	27000	1000	2.80 E-6
0.5751	0.0034	28000	1000	3.36 E-6
0.5788	0.0036	29000	1000	3.64 E-6
0.5830	0.0042	30000	1000	4.20 E-6
0.5872	0.0042	31000	1000	4.20 E-6
0.5914	0.0042	32000	1000	4.20 E-6
0.5953	0.0039	33000	1000	3.92 E-6
0.5984	0.0031	34000	1000	3.08 E-6
0.6023	0.0039	35000	1000	3.92 E-6
0.6065	0.0042	36000	1000	4.20 E-6
RUN NO. 2				
0.6101	0.0036	37000	1000	3.64 E-6
0.6110	0.0008	38000	1000	8.40 E-7
0.6132	0.0022	39000	1000	2.24 E-6
0.6166	0.0034	40000	1000	3.36 E-6
0.6199	0.0034	41000	1000	3.36 E-6
0.6224	0.0025	42000	1000	2.52 E-6
0.6258	0.0034	43000	1000	3.36 E-6
0.6303	0.0045	44000	1000	4.48 E-6
0.6336	0.0034	45000	1000	3.36 E-6
0.6373	0.0036	46000	1000	3.64 E-6
0.6409	0.0036	47000	1000	3.64 E-6
0.6446	0.0036	48000	1000	3.64 E-6
0.6490	0.0045	49000	1000	4.48 E-6

TABLE 170 (continued)

## RUN NO. 3

0.6530	0.0039	50000	1000	3.92 E-6
0.6552	0.0022	51000	1000	2.24 E-6
0.6572	0.0020	52000	1000	1.96 E-6
0.6600	0.0028	53000	1000	2.80 E-6
0.6630	0.0031	54000	1000	3.08 E-6
0.6656	0.0025	55000	1000	2.52 E-6
0.6689	0.0034	56000	1000	3.36 E-6
0.6728	0.0039	57000	1000	3.92 E-6
0.6762	0.0034	58000	1000	3.36 E-6
0.6798	0.0036	59000	1000	3.64 E-6
0.6843	0.0045	60000	1000	4.48 E-6
0.6877	0.0034	61000	1000	3.36 E-6
0.6922	0.0045	62000	1000	4.48 E-6

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	3.55 E-6	0.0018	500
2	1.68 E-6	0.0044	1500
3	2.33 E-6	0.0064	2500
4	2.99 E-6	0.0091	3500
5	3.27 E-6	0.0122	4500
6	2.89 E-6	0.0153	5500
7	3.64 E-6	0.0185	6500
8	4.20 E-6	0.0224	7500
9	3.64 E-6	0.0264	8500
10	3.73 E-6	0.0301	9500
11	3.73 E-6	0.0338	10500
12	3.64 E-6	0.0375	11500
13	4.39 E-6	0.0415	12500

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0035	1000
2	0.0052	2000
3	0.0076	3000
4	0.0105	4000
5	0.0138	5000
6	0.0167	6000
7	0.0203	7000
8	0.0245	8000
9	0.0282	9000
10	0.0319	10000
11	0.0357	11000
12	0.0393	12000
13	0.0437	13000



TABLE 171

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 2-L-9, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=14$ ,  $R=0.5$ ,  $U_c = -2.0$ ,  $S=2.0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.4851	0.0042	2000	1000	4.20 E-6
1.4907	0.0056	6000	4000	1.40 E-6
1.4944	0.0036	8000	2000	1.82 E-6
1.5008	0.0064	10000	2000	3.22 E-6
1.5047	0.0039	11000	1000	3.92 E-6
1.5081	0.0034	12000	1000	3.36 E-6
1.5134	0.0053	13000	1000	5.32 E-6
1.5162	0.0028	14000	1000	2.80 E-6
1.5207	0.0045	15000	1000	4.48 E-6
1.5240	0.0034	16000	1000	3.36 E-6
1.5277	0.0036	17000	1000	3.64 E-6
1.5319	0.0042	18000	1000	4.20 E-6
1.5355	0.0036	19000	1000	3.64 E-6
1.5408	0.0053	20000	1000	5.32 E-6
1.5448	0.0039	21000	1000	3.92 E-6
1.5490	0.0042	22000	1000	4.20 E-6
1.5534	0.0045	23000	1000	4.48 E-6
1.5579	0.0045	24000	1000	4.48 E-6
1.5624	0.0045	25000	1000	4.48 E-6
RUN NO. 2				
1.5663	0.0039	26000	1000	3.92 E-6
1.5719	0.0056	30000	4000	1.40 E-6
1.5758	0.0039	32000	2000	1.96 E-6
1.5809	0.0050	34000	2000	2.52 E-6
1.5848	0.0039	35000	1000	3.92 E-6
1.5882	0.0034	36000	1000	3.36 E-6
1.5904	0.0022	37000	1000	2.24 E-6
1.5932	0.0028	38000	1000	2.80 E-6
1.5966	0.0034	39000	1000	3.36 E-6
1.6005	0.0039	40000	1000	3.92 E-6
1.6044	0.0039	41000	1000	3.92 E-6
1.6089	0.0045	42000	1000	4.48 E-6
1.6128	0.0039	43000	1000	3.92 E-6
1.6178	0.0050	44000	1000	5.04 E-6
1.6223	0.0045	45000	1000	4.48 E-6
1.6274	0.0050	46000	1000	5.04 E-6
1.6318	0.0045	47000	1000	4.48 E-6
1.6363	0.0045	48000	1000	4.48 E-6
1.6408	0.0045	49000	1000	4.48 E-6

TABLE 171

(continued)

RUN NO. 3

1.6442	0.0034	50000	1000	3.36 E-6
1.6492	0.0050	54000	4000	1.26 E-6
1.6531	0.0039	56000	2000	1.96 E-6
1.6582	0.0050	58000	2000	2.52 E-6
1.6610	0.0028	59000	1000	2.80 E-6
1.6649	0.0039	60000	1000	3.92 E-6
1.6688	0.0039	61000	1000	3.92 E-6
1.6722	0.0034	62000	1000	3.36 E-6
1.6766	0.0045	63000	1000	4.48 E-6
1.6811	0.0045	64000	1000	4.48 E-6
1.6850	0.0039	65000	1000	3.92 E-6
1.6901	0.0050	66000	1000	5.04 E-6
1.6940	0.0039	67000	1000	3.92 E-6
1.6985	0.0045	68000	1000	4.48 E-6
1.7024	0.0039	69000	1000	3.92 E-6
1.7063	0.0039	70000	1000	3.92 E-6
1.7108	0.0045	71000	1000	4.48 E-6
1.7147	0.0039	72000	1000	3.92 E-6
1.7198	0.0050	73000	1000	5.04 E-6

RUN NO. 4

1.7220	0.0022	74000	1000	2.24 E-6
1.7282	0.0062	78000	4000	1.54 E-6
1.7318	0.0036	80000	2000	1.82 E-6
1.7368	0.0050	82000	2000	2.52 E-6
1.7396	0.0028	83000	1000	2.80 E-6
1.7422	0.0025	84000	1000	2.52 E-6
1.7450	0.0028	85000	1000	2.80 E-6
1.7503	0.0053	86000	1000	5.32 E-6
1.7534	0.0031	87000	1000	3.08 E-6
1.7567	0.0034	88000	1000	3.36 E-6
1.7612	0.0045	89000	1000	4.48 E-6
1.7651	0.0039	90000	1000	3.92 E-6
1.7688	0.0036	91000	1000	3.64 E-6
1.7732	0.0045	92000	1000	4.48 E-6
1.7777	0.0045	93000	1000	4.48 E-6
1.7825	0.0048	94000	1000	4.76 E-6
1.7864	0.0039	95000	1000	3.92 E-6
1.7906	0.0042	96000	1000	4.20 E-6
1.7951	0.0045	97000	1000	4.48 E-6

TABLE 171 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	3.43 E-6	0.0017	500
2	1.40 E-6	0.0062	3000
3	1.89 E-6	0.0109	6000
4	2.69 E-6	0.0155	8000
5	3.36 E-6	0.0199	9500
6	3.29 E-6	0.0232	10500
7	3.57 E-6	0.0266	11500
8	3.57 E-6	0.0302	12500
9	3.85 E-6	0.0339	13500
10	3.78 E-6	0.0377	14500
11	3.99 E-6	0.0416	15500
12	4.41 E-6	0.0458	16500
13	3.78 E-6	0.0499	17500
14	4.83 E-6	0.0542	18500
15	4.20 E-6	0.0587	19500
16	4.48 E-6	0.0631	20500
17	4.34 E-6	0.0675	21500
18	4.27 E-6	0.0718	22500
19	4.62 E-6	0.0762	23500

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0034	1000
2	0.0090	5000
3	0.0128	7000
4	0.0182	9000
5	0.0216	10000
6	0.0249	11000
7	0.0284	12000
8	0.0320	13000
9	0.0358	14000
10	0.0396	15000
11	0.0436	16000
12	0.0480	17000
13	0.0518	18000
14	0.0566	19000
15	0.0608	20000
16	0.0653	21000
17	0.0696	22000
18	0.0739	23000
19	0.0785	24000

TABLE 172

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 3-L-14, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=14$ ,  $R=0.5$ ,  $U_c=-1.0$ ,  $S=2.5$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.4230	0.0045	33000	1000	4.48 E-6
1.4277	0.0048	37000	4000	1.19 E-6
1.4314	0.0036	39000	2000	1.82 E-6
1.4339	0.0026	41000	2000	1.26 E-6
1.4367	0.0028	43000	2000	1.40 E-6
1.4398	0.0031	45000	2000	1.54 E-6
1.4434	0.0036	47000	2000	1.82 E-6
1.4473	0.0039	49000	2000	1.96 E-6
1.4501	0.0028	51000	2000	1.40 E-6
1.4554	0.0053	53000	2000	2.66 E-6
1.4605	0.0050	55000	2000	2.52 E-6
1.4633	0.0028	56000	1000	2.80 E-6
1.4664	0.0031	57000	1000	3.08 E-6
1.4694	0.0031	58000	1000	3.08 E-6
1.4734	0.0039	59000	1000	3.92 E-6
1.4764	0.0031	60000	1000	3.08 E-6
1.4801	0.0036	61000	1000	3.64 E-6
1.4846	0.0045	62000	1000	4.48 E-6
1.4885	0.0039	63000	1000	3.92 E-6
1.4918	0.0034	64000	1000	3.36 E-6
1.4958	0.0039	65000	1000	3.92 E-6
1.4991	0.0034	66000	1000	3.36 E-6
1.5042	0.0050	67000	1000	5.04 E-6
1.5084	0.0042	68000	1000	4.20 E-6
1.5117	0.0034	69000	1000	3.36 E-6
1.5162	0.0045	70000	1000	4.48 E-6

TABLE 172 (continued)

RUN NO. 2

1.5330	0.0053	74000	1000	5.32 E-6
1.5386	0.0056	78000	4000	1.40 E-6
1.5406	0.0020	80000	2000	9.80 E-7
1.5434	0.0028	82000	2000	1.40 E-6
1.5478	0.0045	84000	2000	2.24 E-6
1.5518	0.0039	86000	2000	1.96 E-6
1.5562	0.0045	88000	2000	2.24 E-6
1.5621	0.0059	90000	2000	2.94 E-6
1.5674	0.0053	92000	2000	2.66 E-6
1.5736	0.0062	94000	2000	3.08 E-6
1.5809	0.0073	96000	2000	3.64 E-6
1.5840	0.0031	97000	1000	3.08 E-6
1.5879	0.0039	98000	1000	3.92 E-6
1.5915	0.0036	99000	1000	3.64 E-6
1.5949	0.0034	100000	1000	3.36 E-6
1.5999	0.0050	101000	1000	5.04 E-6
1.6038	0.0039	102000	1000	3.92 E-6
1.6072	0.0034	103000	1000	3.36 E-6
1.6111	0.0039	104000	1000	3.92 E-6
1.6148	0.0036	105000	1000	3.64 E-6
1.6187	0.0039	106000	1000	3.92 E-6
1.6226	0.0039	107000	1000	3.92 E-6
1.6265	0.0039	108000	1000	3.92 E-6
1.6307	0.0042	109000	1000	4.20 E-6
1.6349	0.0042	110000	1000	4.20 E-6
1.6386	0.0036	111000	1000	3.64 E-6

TABLE 172 (continued)

RUN NO. 3

1.6542	0.0045	115000	1000	4.48 E-6
1.6610	0.0067	119000	4000	1.68 E-6
1.6629	0.0020	121000	2000	9.80 E-7
1.6666	0.0036	123000	2000	1.82 E-6
1.6702	0.0036	125000	2000	1.82 E-6
1.6741	0.0039	127000	2000	1.96 E-6
1.6778	0.0036	129000	2000	1.82 E-6
1.6828	0.0050	131000	2000	2.52 E-6
1.6878	0.0050	133000	2000	2.52 E-6
1.6934	0.0056	135000	2000	2.80 E-6
1.6993	0.0059	137000	2000	2.94 E-6
1.7021	0.0028	138000	1000	2.80 E-6
1.7052	0.0031	139000	1000	3.08 E-6
1.7080	0.0028	140000	1000	2.80 E-6
1.7105	0.0025	141000	1000	2.52 E-6
1.7144	0.0039	142000	1000	3.92 E-6
1.7184	0.0039	143000	1000	3.92 E-6
1.7217	0.0034	144000	1000	3.36 E-6
1.7259	0.0042	145000	1000	4.20 E-6
1.7298	0.0039	146000	1000	3.92 E-6
1.7335	0.0036	147000	1000	3.64 E-6
1.7380	0.0045	148000	1000	4.48 E-6
1.7413	0.0034	149000	1000	3.36 E-6
1.7455	0.0042	150000	1000	4.20 E-6
1.7500	0.0045	151000	1000	4.48 E-6
1.7545	0.0045	152000	1000	4.48 E-6

TABLE 172 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	4.76 E-6	0.0024	500
2	1.42 E-6	0.0076	3000
3	1.26 E-6	0.0117	6000
4	1.49 E-6	0.0145	8000
5	1.82 E-6	0.0178	10000
6	1.82 E-6	0.0215	12000
7	1.96 E-6	0.0252	14000
8	2.47 E-6	0.0297	16000
9	2.19 E-6	0.0343	18000
10	2.85 E-6	0.0394	20000
11	3.03 E-6	0.0452	22000
12	2.89 E-6	0.0497	23500
13	3.36 E-6	0.0528	24500
14	3.17 E-6	0.0561	25500
15	3.27 E-6	0.0593	26500
16	4.01 E-6	0.0630	27500
17	3.83 E-6	0.0669	28500
18	3.73 E-6	0.0707	29500
19	4.01 E-6	0.0745	30500
20	3.64 E-6	0.0784	31500
21	3.83 E-6	0.0821	32500
22	3.92 E-6	0.0860	33500
23	4.11 E-6	0.0900	34500
24	4.20 E-6	0.0941	35500
25	4.01 E-6	0.0982	36500
26	4.20 E-6	0.1023	37500

TABLE 172 (continued)

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0048	1000
2	0.0105	5000
3	0.0130	7000
4	0.0160	9000
5	0.0196	11000
6	0.0233	13000
7	0.0272	15000
8	0.0321	17000
9	0.0365	19000
10	0.0422	21000
11	0.0482	23000
12	0.0511	24000
13	0.0545	25000
14	0.0577	26000
15	0.0609	27000
16	0.0650	28000
17	0.0688	29000
18	0.0725	30000
19	0.0765	31000
20	0.0802	32000
21	0.0840	33000
22	0.0879	34000
23	0.0920	35000
24	0.0962	36000
25	0.1002	37000
26	0.1044	38000



TABLE 173

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 3-L-17, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=14$ ,  $R=0.5$ ,  $U_c = -2.0$ ,  $S=2.5$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.8386	0.0053	130000	1000	5.32 E-6
0.8428	0.0042	134000	4000	1.05 E-6
0.8470	0.0042	138000	4000	1.05 E-6
0.8506	0.0037	142000	4000	9.10 E-7
0.8548	0.0042	146000	4000	1.05 E-6
0.8604	0.0056	150000	4000	1.40 E-6
0.8646	0.0042	153000	3000	1.40 E-6
0.8688	0.0042	155000	2000	2.10 E-6
0.8733	0.0045	157000	2000	2.24 E-6
0.8781	0.0048	159000	2000	2.38 E-6
0.8826	0.0044	161000	2000	2.24 E-6
0.8884	0.0058	163000	2000	2.94 E-6
0.8938	0.0053	165000	2000	2.66 E-6
0.8988	0.0050	167000	2000	2.52 E-6
0.9052	0.0065	169000	2000	3.22 E-6
0.9114	0.0062	171000	2000	3.08 E-6
0.9184	0.0070	173000	2000	3.50 E-6
0.9257	0.0073	175000	2000	3.64 E-6
0.9338	0.0081	177000	2000	4.06 E-6
0.9408	0.0070	179000	2000	3.50 E-6
0.9489	0.0081	181000	2000	4.06 E-6
0.9570	0.0081	183000	2000	4.05 E-6
0.9643	0.0073	185000	2000	3.64 E-6
0.9722	0.0078	187000	2000	3.92 E-6
0.9808	0.0087	189000	2000	4.34 E-6
0.9881	0.0073	191000	2000	3.64 E-6
0.9962	0.0081	193000	2000	4.05 E-6
1.0041	0.0078	195000	2000	3.92 E-6
1.0122	0.0081	197000	2000	4.06 E-6

TABLE 173 (continued)

RUN NO. 2

1.0164	0.0042	198000	1000	4.20 E-6
1.0220	0.0056	202000	4000	1.40 E-6
1.0270	0.0051	206000	4000	1.26 E-6
1.0312	0.0042	210000	4000	1.05 E-6
1.0360	0.0045	214000	4000	1.19 E-6
1.0416	0.0056	218000	4000	1.40 E-6
1.0480	0.0065	221000	3000	2.15 E-6
1.0525	0.0045	223000	2000	2.24 E-6
1.0576	0.0050	225000	2000	2.52 E-6
1.0615	0.0039	227000	2000	1.96 E-6
1.0674	0.0059	229000	2000	2.94 E-6
1.0735	0.0062	231000	2000	3.08 E-6
1.0797	0.0062	233000	2000	3.08 E-6
1.0850	0.0053	235000	2000	2.66 E-6
1.0914	0.0065	237000	2000	3.22 E-6
1.0976	0.0062	239000	2000	3.52 E-6
1.1043	0.0067	241000	2000	3.36 E-6
1.1127	0.0084	243000	2000	4.20 E-6
1.1206	0.0078	245000	2000	3.92 E-6
1.1264	0.0059	247000	2000	2.94 E-6
1.1329	0.0064	249000	2000	3.22 E-6
1.1396	0.0067	251000	2000	3.36 E-6
1.1463	0.0067	253000	2000	3.36 E-6
1.1544	0.0081	255000	2000	4.06 E-6
1.1626	0.0081	257000	2000	4.06 E-6
1.1696	0.0070	259000	2000	3.50 E-6
1.1771	0.0076	261000	2000	3.78 E-6
1.1838	0.0067	263000	2000	3.36 E-6
1.1917	0.0078	265000	2000	3.92 E-6

TABLE 173 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	4.76 E-6	0.0024	500
2	1.22 E-6	0.0072	3000
3	1.16 E-6	0.0120	7000
4	9.80 E-7	0.0163	11000
5	1.12 E-6	0.0204	15000
6	1.40 E-6	0.0254	19000
7	1.78 E-6	0.0309	22500
8	2.17 E-6	0.0357	25000
9	2.38 E-6	0.0403	27000
10	2.17 E-6	0.0448	29000
11	2.59 E-6	0.0496	31000
12	3.01 E-6	0.0552	33000
13	2.87 E-6	0.0610	35000
14	2.59 E-6	0.0665	37000
15	3.22 E-6	0.0723	39000
16	3.30 E-6	0.0787	41000
17	3.43 E-6	0.0852	43000
18	3.92 E-6	0.0925	45000
19	3.99 E-6	0.1004	47000
20	3.22 E-6	0.1076	49000
21	3.64 E-6	0.1145	51000
22	3.71 E-6	0.1218	53000
23	3.50 E-6	0.1290	55000
24	3.99 E-6	0.1365	57000
25	4.20 E-6	0.1447	59000
26	3.57 E-6	0.1524	61000
27	3.92 E-6	0.1599	63000
28	3.64 E-6	0.1675	65000
29	3.99 E-6	0.1751	67000

TABLE 173 (continued)

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0048	1000
2	0.0097	5000
3	0.0143	9000
4	0.0183	13000
5	0.0226	17000
6	0.0282	21000
7	0.0336	24000
8	0.0379	26000
9	0.0427	28000
10	0.0470	30000
11	0.0522	32000
12	0.0582	34000
13	0.0639	36000
14	0.0691	38000
15	0.0756	40000
16	0.0818	42000
17	0.0886	44000
18	0.0965	46000
19	0.1044	48000
20	0.1109	50000
21	0.1181	52000
22	0.1255	54000
23	0.1325	56000
24	0.1405	58000
25	0.1489	60000
26	0.1560	62000
27	0.1639	64000
28	0.1711	66000
29	0.1791	68000

TABLE 174

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 6-L-1, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=14$ ,  $R=0.5$ ,  $U_c = -1$ ,  $S=3.0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.3404	0.0031	81000	1000	3.08 E-6
1.3625	0.0221	91000	10000	2.21 E-6
1.3782	0.0157	101000	10000	1.57 E-6
1.3961	0.0179	111000	10000	1.79 E-6
1.4008	0.0048	113000	2000	2.38 E-6
1.4050	0.0042	115000	2000	2.10 E-6
1.4090	0.0039	117000	2000	1.96 E-6
1.4160	0.0070	119000	2000	3.50 E-6
1.4207	0.0048	121000	2000	2.38 E-6
1.4269	0.0062	123000	2000	3.08 E-6
1.4305	0.0036	125000	2000	1.82 E-6
1.4392	0.0087	127000	2000	4.34 E-6
1.4440	0.0048	129000	2000	2.38 E-6
1.4510	0.0070	131000	2000	3.50 E-6
1.4580	0.0070	133000	2000	3.50 E-6
1.4650	0.0070	135000	2000	3.50 E-6
1.4717	0.0067	137000	2000	3.36 E-6
1.4784	0.0067	139000	2000	3.36 E-6
1.4848	0.0064	141000	2000	3.22 E-6
1.4916	0.0067	143000	2000	3.36 E-6
1.4988	0.0073	145000	2000	3.64 E-6
1.5047	0.0059	147000	2000	2.94 E-6
1.5131	0.0084	149000	2000	4.20 E-6
1.5198	0.0067	151000	2000	3.36 E-6
1.5282	0.0084	153000	2000	4.20 E-6
1.5369	0.0087	155000	2000	4.34 E-6
1.5450	0.0081	157000	2000	4.06 E-6
1.5534	0.0084	159000	2000	4.20 E-6

TABLE 174 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	3.08 E-6	0.0015	500
2	2.21 E-6	0.0141	6000
3	1.57 E-6	0.0330	16000
4	1.79 E-6	0.0498	26000
5	2.38 E-6	0.0612	32000
6	2.10 E-6	0.0657	34000
7	1.96 E-6	0.0697	36000
8	3.50 E-6	0.0752	38000
9	2.38 E-6	0.0811	40000
10	3.08 E-6	0.0865	42000
11	1.82 E-6	0.0914	44000
12	4.34 E-6	0.0976	46000
13	2.38 E-6	0.1043	48000
14	3.50 E-6	0.1102	50000
15	3.50 E-6	0.1172	52000
16	3.50 E-6	0.1242	54000
17	3.36 E-6	0.1310	56000
18	3.36 E-6	0.1378	58000
19	3.22 E-6	0.1443	60000
20	3.36 E-6	0.1509	62000
21	3.64 E-6	0.1579	64000
22	2.94 E-6	0.1645	66000
23	4.20 E-6	0.1716	68000
24	3.36 E-6	0.1792	70000
25	4.20 E-6	0.1868	72000
26	4.34 E-6	0.1953	74000
27	4.06 E-6	0.2037	76000
28	4.20 E-6	0.2120	78000

TABLE 174 (continued)

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0031	1000
2	0.0252	11000
3	0.0409	21000
4	0.0588	31000
5	0.0636	33000
6	0.0678	35000
7	0.0717	37000
8	0.0787	39000
9	0.0834	41000
10	0.0896	43000
11	0.0932	45000
12	0.1019	47000
13	0.1067	49000
14	0.1137	51000
15	0.1207	53000
16	0.1277	55000
17	0.1344	57000
18	0.1411	59000
19	0.1476	61000
20	0.1543	63000
21	0.1616	65000
22	0.1674	67000
23	0.1758	69000
24	0.1826	71000
25	0.1910	73000
26	0.1996	75000
27	0.2078	77000
28	0.2162	79000

TABLE 175

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 5-L-3, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=14$ ,  $R=0.5$ ,  $U_c=-2$ ,  $S=3.0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.7091	0.0039	46000	1000	3.92 E-6
1.7248	0.0157	66000	20000	7.84 E-7
1.7315	0.0067	76000	10000	6.72 E-7
1.7360	0.0045	86000	10000	4.48 E-7
1.7394	0.0034	96000	10000	3.40 E-7
1.7472	0.0078	106000	10000	7.80 E-7
1.7528	0.0056	116000	10000	5.60 E-7
1.7578	0.0050	126000	10000	5.04 E-7
1.7640	0.0062	136000	10000	6.16 E-7
1.7718	0.0078	146000	10000	7.84 E-7
1.7774	0.0056	150000	4000	1.40 E-6
1.7819	0.0045	154000	4000	1.12 E-6
1.7875	0.0056	158000	4000	1.40 E-6
1.7937	0.0062	162000	4000	1.54 E-6
1.8010	0.0073	166000	4000	1.82 E-6
1.8077	0.0067	170000	4000	1.68 E-6
1.8189	0.0112	174000	4000	2.80 E-6
1.8278	0.0090	178000	4000	2.24 E-6
1.8385	0.0106	182000	4000	2.66 E-6
1.8502	0.0118	186000	4000	2.94 E-6
1.8637	0.0134	190000	4000	3.36 E-6
1.8771	0.0134	194000	4000	3.36 E-6
1.8928	0.0157	198000	4000	3.92 E-6
1.9085	0.0157	202000	4000	3.92 E-6
1.9225	0.0140	206000	4000	3.50 E-6
1.9376	0.0151	21000	4000	3.78 E-6



TABLE 175 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	3.92 E-6	0.0020	500
2	7.84 E-7	0.0118	11000
3	6.72 E-7	0.0230	26000
4	4.48 E-7	0.0286	36000
5	3.40 E-7	0.0325	46000
6	7.80 E-7	0.0381	56000
7	5.60 E-7	0.0448	66000
8	5.04 E-7	0.0501	76000
9	6.16 E-7	0.0557	86000
10	7.84 E-7	0.0627	96000
11	1.40 E-6	0.0694	103000
12	1.12 E-6	0.0745	107000
13	1.40 E-6	0.0795	111000
14	1.54 E-6	0.0854	115000
15	1.82 E-6	0.0921	119000
16	1.68 E-6	0.0991	123000
17	2.80 E-6	0.1081	127000
18	2.24 E-6	0.1182	131000
19	2.66 E-6	0.1280	135000
20	2.94 E-6	0.1392	139000
21	3.36 E-6	0.1518	143000
22	3.36 E-6	0.1652	147000
23	3.92 E-6	0.1798	151000
24	3.92 E-6	0.1954	155000
25	3.50 E-6	0.2103	159000
26	3.78 E-6	0.2248	163000

TABLE 175 (continued)

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0039	1000
2	0.0196	21000
3	0.0263	31000
4	0.0308	41000
5	0.0342	51000
6	0.0420	61000
7	0.0476	71000
8	0.0526	81000
9	0.0588	91000
10	0.0666	101000
11	0.0722	105000
12	0.0767	109000
13	0.0823	113000
14	0.0885	117000
15	0.0958	121000
16	0.1025	125000
17	0.1137	129000
18	0.1226	133000
19	0.1333	137000
20	0.1450	141000
21	0.1585	145000
22	0.1719	149000
23	0.1876	153000
24	0.2033	157000
25	0.2173	161000
26	0.2324	165000

Data adjusted to reflect growth of one crack tip.

TABLE 176

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 6-L-1, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=14$ ,  $R=0.5$ ,  $U_c=-1$ ,  $S=3.5$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.5870	0.0045	3000	1000	4.48 E-6
1.6145	0.0274	13000	10000	2.74 E-6
1.6279	0.0134	23000	10000	1.34 E-6
1.6374	0.0095	33000	10000	9.52 E-7
1.6442	0.0067	43000	10000	6.72 E-7
1.6531	0.0090	53000	10000	8.96 E-7
1.6593	0.0062	63000	10000	6.16 E-7
1.6699	0.0106	73000	10000	1.06 E-6
1.6778	0.0078	83000	10000	7.84 E-7
1.6867	0.0090	93000	10000	8.96 E-7
1.6968	0.0101	103000	10000	1.01 E-6
1.7078	0.0110	113000	10000	1.10 E-6
1.7214	0.0137	123000	10000	1.37 E-6
1.7394	0.0179	133000	10000	1.79 E-6
1.7584	0.0190	143000	10000	1.90 E-6
1.7808	0.0224	153000	10000	2.24 E-6
1.8054	0.0246	163000	10000	2.46 E-6
1.8256	0.0202	173000	10000	2.02 E-6
1.8659	0.0403	183000	10000	4.03 E-6
1.8995	0.0336	193000	10000	3.36 E-6
1.9376	0.0381	203000	10000	3.81 E-6
1.9746	0.0370	213000	10000	3.70 E-6
2.0126	0.0381	223000	10000	3.81 E-6
2.0530	0.0403	233000	10000	4.03 E-6
2.0944	0.0414	243000	10000	4.14 E-6
2.1370	0.0426	253000	10000	4.26 E-6
2.1795	0.0426	263000	10000	4.26 E-6
2.2277	0.0482	273000	10000	4.82 E-6
2.2736	0.0459	283000	10000	4.59 E-6

TABLE 176 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	4.48 E-6	0.0022	500
2	2.74 E-6	0.0182	6000
3	1.34 E-6	0.0386	16000
4	9.52 E-7	0.0501	26000
5	6.72 E-7	0.0582	36000
6	8.96 E-7	0.0661	46000
7	6.16 E-7	0.0736	56000
8	1.06 E-6	0.0820	66000
9	7.84 E-7	0.0913	76000
10	8.96 E-7	0.0997	86000
11	1.01 E-6	0.1092	96000
12	1.10 E-6	0.1197	106000
13	1.37 E-6	0.1320	116000
14	1.79 E-6	0.1478	126000
15	1.90 E-6	0.1663	136000
16	2.24 E-6	0.1870	146000
17	2.46 E-6	0.2106	156000
18	2.02 E-6	0.2330	166000
19	4.03 E-6	0.2632	176000
20	3.36 E-6	0.3002	186000
21	3.81 E-6	0.3360	196000
22	3.70 E-6	0.3735	206000
23	3.81 E-6	0.4110	216000
24	4.03 E-6	0.4502	226000
25	4.14 E-6	0.4911	236000
26	4.26 E-6	0.5331	246000
27	4.26 E-6	0.5757	256000
28	4.82 E-6	0.6210	266000
29	4.59 E-6	0.6681	276000

TABLE 176 (continued)

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0045	1000
2	0.0319	11000
3	0.0454	21000
4	0.0549	31000
5	0.0616	41000
6	0.0706	51000
7	0.0767	61000
8	0.0874	71000
9	0.0952	81000
10	0.1042	91000
11	0.1142	101000
12	0.1252	111000
13	0.1389	121000
14	0.1568	131000
15	0.1758	141000
16	0.1982	151000
17	0.2229	161000
18	0.2430	171000
19	0.2834	181000
20	0.3170	191000
21	0.3550	201000
22	0.3920	211000
23	0.4301	221000
24	0.4704	231000
25	0.5118	241000
26	0.5544	251000
27	0.5970	261000
28	0.6451	271000
29	0.6910	281000

Data adjusted to reflect growth of one crack tip.

TABLE 177

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 1-L-5, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=14$ ,  $R=0.5$ ,  $U_c=-2$ ,  $S=3.5$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.9615	0.0036	6000	1000	3.64 E-6
1.0011	0.00396	31000	25000	1.58 E-6
1.0172	0.0161	51000	20000	8.07 E-7
1.0455	0.0282	91000	40000	7.07 E-7
1.0758	0.0302	121000	30000	1.01 E-6
1.0996	0.0238	141000	20000	1.19 E-6
1.1323	0.0328	161000	20000	1.64 E-6
1.1612	0.0288	177000	16000	1.80 E-6
1.1939	0.0327	193000	16000	2.04 E-6
1.2295	0.0356	209000	16000	2.22 E-6
1.2712	0.0418	225000	16000	2.61 E-6
1.3182	0.0470	241000	16000	2.94 E-6
1.3670	0.0487	257000	16000	3.04 E-6
1.4193	0.0526	273000	16000	3.28 E-6
1.4756	0.0563	289000	16000	3.52 E-6
1.5299	0.0543	305000	16000	3.40 E-6
1.5869	0.0579	321250	16000	3.56 E-6
1.6464	0.0595	337250	16000	3.72 E-6
1.7066	0.0602	353250	16000	3.76 E-6
1.7523	0.0467	369250	16000	2.92 E-6
1.8127	0.0593	385250	16000	3.71 E-6
1.8413	0.0286	393250	8000	3.57 E-6
1.8682	0.0269	401250	8000	3.36 E-6
1.8984	0.0302	409250	8000	3.78 E-6
1.9264	0.0280	417250	8000	3.50 E-6
1.9550	0.0286	425250	8000	3.57 E-6
1.9841	0.0291	433250	8000	3.64 E-6
2.0110	0.0269	441250	8000	3.36 E-6
2.0373	0.0263	449250	8000	3.29 E-6

TABLE 177 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	3.64 E-6	0.0018	500
2	1.58 E-6	0.0034	13500
3	8.07 E-7	0.00513	36000
4	7.07 E-7	0.00734	66000
5	1.01 E-6	0.1026	101000
6	1.19 E-6	0.1296	126000
7	1.64 E-6	0.1579	146000
8	1.80 E-6	0.1887	164000
9	2.04 E-6	0.2195	180000
10	2.22 E-6	0.2536	196000
11	2.61 E-6	0.2923	212000
12	2.94 E-6	0.3367	228000
13	3.04 E-6	0.3846	244000
14	3.28 E-6	0.4352	260000
15	3.52 E-6	0.4897	276000
16	3.40 E-6	0.5450	292000
17	3.56 E-6	0.6011	308000
18	3.72 E-6	0.6598	324000
19	3.76 E-6	0.7196	340000
20	2.92 E-6	0.7731	356000
21	3.71 E-6	0.8261	372000
22	3.57 E-6	0.8700	384000
23	3.36 E-6	0.8977	392000
24	3.78 E-6	0.9263	400000
25	3.50 E-6	0.9554	408000
26	3.57 E-6	0.9837	416000
27	3.64 E-6	1.0125	424000
28	3.36 E-6	1.0405	432000
29	3.29 E-6	1.0671	440000

TABLE 177 (continued)

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0036	1000
2	0.0432	26000
3	0.0593	46000
4	0.0875	86000
5	0.1177	116000
6	0.1415	136000
7	0.1743	156000
8	0.2031	172000
9	0.2358	188000
10	0.2714	204000
11	0.3132	220000
12	0.3602	236000
13	0.4089	252000
14	0.4615	268000
15	0.5178	284000
16	0.5721	300000
17	0.6300	316000
18	0.6895	332000
19	0.7497	348000
20	0.7964	364000
21	0.8557	380000
22	0.8843	388000
23	0.9112	396000
24	0.9414	404000
25	0.9694	412000
26	0.9980	420000
27	1.0271	428000
28	1.0540	436000
29	1.0803	444000



TABLE 178

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 2-L-17, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=14$ ,  $R=0.5$ ,  $U_c = -1$ ,  $S=4.0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.9027	0.0325	2000	1000	3.25 E-5
0.9688	0.0661	32000	30000	2.20 E-6
0.9929	0.0241	52000	20000	1.20 E-6
1.0122	0.0193	72000	20000	9.66 E-7
1.0354	0.0232	92000	20000	1.16 E-6
1.0581	0.0227	112000	20000	1.13 E-6
1.0881	0.0300	132000	20000	1.50 E-6
1.1234	0.0353	152000	20000	1.76 E-6
1.1659	0.0425	172000	20000	2.12 E-6
1.2107	0.0448	192000	20000	2.24 E-6
1.2611	0.0504	212000	20000	2.52 E-6
1.3166	0.0554	232000	20000	2.77 E-6
1.3703	0.0538	252000	20000	2.69 E-6
1.4297	0.0593	272000	20000	2.96 E-6
1.4924	0.0627	292000	20000	3.13 E-6
1.5238	0.0314	302000	10000	3.14 E-6
1.5562	0.0325	312000	10000	3.25 E-6
1.5904	0.0342	322000	10000	3.42 E-6
1.6234	0.0330	332000	10000	3.30 E-6
1.6565	0.0330	342000	10000	3.30 E-6
1.6901	0.0336	352000	10000	3.36 E-6
1.7242	0.0342	362000	10000	3.42 E-6
1.7618	0.0375	372000	10000	3.75 E-6
1.7970	0.0353	382000	10000	3.53 E-6
1.8318	0.0347	392000	10000	3.47 E-6
1.8656	0.0339	402000	10000	3.39 E-6
1.9079	0.0423	412000	10000	4.23 E-6
1.9466	0.0386	422000	10000	3.86 E-6
1.9863	0.0398	432000	10000	3.98 E-6

TABLE 178 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	3.25 E-5	0.0162	500
2	2.20 E-6	0.0655	16000
3	1.20 E-6	0.1106	41000
4	9.66 E-7	0.1323	61000
5	1.16 E-6	0.1536	81000
6	1.13 E-6	0.1765	101000
7	1.50 E-6	0.2029	121000
8	1.76 E-6	0.2355	141000
9	2.12 E-6	0.2744	161000
10	2.24 E-6	0.3181	181000
11	2.52 E-6	0.3657	201000
12	2.77 E-6	0.4186	221000
13	2.69 E-6	0.4732	241000
14	2.96 E-6	0.5297	261000
15	3.13 E-6	0.5907	281000
16	3.14 E-6	0.6378	296000
17	3.25 E-6	0.6697	306000
18	3.42 E-6	0.7030	316000
19	3.30 E-6	0.7366	326000
20	3.30 E-6	0.7697	336000
21	3.36 E-6	0.8030	346000
22	3.42 E-6	0.8369	356000
23	3.75 E-6	0.8727	366000
24	3.53 E-6	0.9091	376000
25	3.47 E-6	0.9441	386000
26	3.39 E-6	0.9784	396000
27	4.23 E-6	1.0165	406000
28	3.86 E-6	1.0570	416000
29	3.98 E-6	1.0962	426000

TABLE 178 (continued)

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0325	1000
2	0.0986	31000
3	0.1227	51000
4	0.1420	71000
5	0.1652	91000
6	0.1879	111000
7	0.2179	131000
8	0.2532	151000
9	0.2957	171000
10	0.3405	191000
11	0.3909	211000
12	0.4463	231000
13	0.5001	251000
14	0.5594	271000
15	0.6221	291000
16	0.6535	301000
17	0.6860	311000
18	0.7201	321000
19	0.7532	331000
20	0.7862	341000
21	0.8198	351000
22	0.8540	361000
23	0.8915	371000
24	0.9268	381000
25	0.9615	391000
26	0.9954	401000
27	1.0376	411000
28	1.0763	421000
29	1.1160	431000

Data Tabulations for Tension-Compression Load  
Class,  $K_2=10$  and  $K_5 = -7.5 \text{ KSI } \sqrt{\text{In.}}$

TABLE 179

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 6-L-18, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.1$ ,  $U_c = -2.67$ ,  $S=2.0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.4995	0.0053	7000	1000	5.27 E-6
0.5031	0.0036	9000	2000	1.80 E-6
0.5059	0.0028	11000	2000	1.39 E-6
0.5103	0.0044	13000	2000	2.22 E-6
0.5178	0.0075	15000	2000	3.75 E-6
0.5256	0.0075	17000	2000	3.88 E-6
0.5356	0.0100	19000	2000	5.00 E-6
0.5439	0.0083	21000	2000	4.16 E-6
0.5556	0.0117	23000	2000	5.83 E-6
0.5669	0.0114	25000	2000	5.69 E-6
0.5778	0.0108	27000	2000	5.41 E-6
0.5877	0.0100	29000	2000	4.99 E-6
0.5977	0.0100	31000	2000	4.99 E-6
0.6072	0.0094	33000	2000	4.72 E-6
0.6185	0.0114	35000	2000	5.69 E-6
0.6285	0.0100	37000	2000	5.00 E-6
RUN NO. 2				
0.6419	0.0044	40000	1000	4.44 E-6
0.6452	0.0033	42000	2000	1.67 E-6
0.6485	0.0033	44000	2000	1.67 E-6
0.6527	0.0042	46000	2000	2.08 E-6
0.6582	0.0055	48000	2000	2.77 E-6
0.6660	0.0078	50000	2000	3.89 E-6
0.6754	0.0094	52000	2000	4.72 E-6
0.6851	0.0097	54000	2000	4.86 E-6
0.6949	0.0097	56000	2000	4.86 E-6
0.7049	0.0100	58000	2000	4.99 E-6
0.7143	0.0094	60000	2000	4.72 E-6
0.7246	0.0103	62000	2000	5.13 E-6
0.7332	0.0086	64000	2000	4.30 E-6
0.7440	0.0108	66000	2000	5.41 E-6
0.7537	0.0097	68000	2000	4.86 E-6
0.7634	0.0097	70000	2000	4.86 E-6

TABLE 179 (continued)

RUN NO. 3

0.7814	0.0039	74000	1000	3.88 E-6
0.7848	0.0033	76000	2000	1.66 E-6
0.7873	0.0025	78000	2000	1.25 E-6
0.7912	0.0039	80000	2000	1.94 E-6
0.7975	0.0064	82000	2000	3.19 E-6
0.8042	0.0067	84000	2000	3.33 E-6
0.8122	0.0080	86000	2000	4.02 E-6
0.8233	0.0111	88000	2000	5.55 E-6
0.8342	0.0108	90000	2000	5.41 E-6
0.8450	0.0108	92000	2000	5.41 E-6
0.8558	0.0108	94000	2000	5.41 E-6
0.8647	0.0089	96000	2000	4.44 E-6
0.8744	0.0097	98000	2000	4.86 E-6
0.8852	0.0108	100000	2000	5.41 E-6
0.8952	0.0100	102000	2000	4.99 E-6
0.9049	0.0097	104000	2000	4.86 E-6

TABLE 179 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	4.53 E-6	0.0023	500
2	1.71 E-6	0.0062	2000
3	1.43 E-6	0.0094	4000
4	2.08 E-6	0.0129	6000
5	3.24 E-6	0.0182	8000
6	3.70 E-6	0.0252	10000
7	4.58 E-6	0.0334	12000
8	4.86 E-6	0.0429	14000
9	5.37 E-6	0.0531	16000
10	5.36 E-6	0.0638	18000
11	5.18 E-6	0.0744	20000
12	4.86 E-6	0.0844	22000
13	4.72 E-6	0.0940	24000
14	5.18 E-6	0.1039	26000
15	5.18 E-6	0.1142	28000
16	4.90 E-6	0.1243	30000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0045	1000
2	0.0080	3000
3	0.0108	5000
4	0.0150	7000
5	0.0215	9000
6	0.0289	11000
7	0.0380	13000
8	0.0477	15000
9	0.0585	17000
10	0.0692	19000
11	0.0796	21000
12	0.0893	23000
13	0.0987	25000
14	0.1091	27000
15	0.1194	29000
16	0.1292	31000

TABLE 180

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 6-L-18, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.3$ ,  $U_c = -2.67$ ,  $S=2.0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.9230	0.0033	5000	1000	3.33 E-6
0.9244	0.0014	7000	2000	6.94 E-7
0.9269	0.0025	9000	2000	1.25 E-6
0.9285	0.0017	11000	2000	8.32 E-7
0.9321	0.0036	13000	2000	1.80 E-6
0.9366	0.0044	15000	2000	2.22 E-6
0.9407	0.0042	17000	2000	2.08 E-6
0.9463	0.0056	19000	2000	2.78 E-6
0.9524	0.0061	21000	2000	3.05 E-6
0.9582	0.0058	23000	2000	2.91 E-6
0.9643	0.0061	25000	2000	3.05 E-6
0.9710	0.0067	27000	2000	3.33 E-6
0.9779	0.0069	29000	2000	3.47 E-6
0.9837	0.0058	31000	2000	2.91 E-6
0.9901	0.0064	33000	2000	3.19 E-6
0.9962	0.0061	35000	2000	3.05 E-6
RUN NO. 2				
0.9993	0.0031	36000	1000	3.05 E-6
1.0004	0.0011	38000	2000	5.55 E-7
1.0032	0.0028	40000	2000	1.39 E-6
1.0057	0.0025	42000	2000	1.25 E-6
1.0095	0.0039	44000	2000	1.94 E-6
1.0129	0.0033	46000	2000	1.67 E-6
1.0187	0.0058	48000	2000	2.91 E-6
1.0251	0.0064	50000	2000	3.19 E-6
1.0306	0.0056	52000	2000	2.78 E-6
1.0362	0.0055	54000	2000	2.77 E-6
1.0434	0.0072	56000	2000	3.61 E-6
1.0487	0.0053	58000	2000	2.64 E-6
1.0553	0.0067	60000	2000	3.33 E-6
1.0623	0.0069	62000	2000	3.47 E-6
1.0692	0.0069	64000	2000	3.47 E-6
1.0764	0.0072	66000	2000	3.61 E-6



TABLE 180 (continued)

RUN NO. 3

1.0789	0.0025	67000	1000	2.50 E-6
1.0803	0.0014	69000	2000	6.94 E-7
1.0825	0.0022	71000	2000	1.11 E-6
1.0861	0.0036	73000	2000	1.80 E-6
1.0884	0.0022	75000	2000	1.11 E-6
1.0928	0.0044	77000	2000	2.22 E-6
1.0995	0.0067	79000	2000	3.33 E-6
1.1067	0.0072	81000	2000	3.61 E-6
1.1114	0.0047	83000	2000	2.36 E-6
1.1178	0.0064	85000	2000	3.19 E-6
1.1247	0.0069	87000	2000	3.47 E-6
1.1311	0.0064	89000	2000	3.19 E-6
1.1372	0.0061	91000	2000	3.05 E-6
1.1436	0.0064	93000	2000	3.19 E-6
1.1505	0.0069	95000	2000	3.47 E-6
1.1566	0.0061	97000	2000	3.05 E-6

TABLE 180 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	2.96 E-6	0.0015	500
2	6.47 E-7	0.0036	2000
3	1.25 E-6	0.0055	4000
4	1.29 E-6	0.0080	6000
5	1.62 E-6	0.0110	8000
6	2.04 E-6	0.0146	10000
7	2.78 E-6	0.0194	12000
8	3.19 E-6	0.0254	14000
9	2.73 E-6	0.0313	16000
10	2.96 E-6	0.0370	18000
11	3.38 E-6	0.0433	20000
12	3.05 E-6	0.0498	22000
13	3.28 E-6	0.0561	24000
14	3.19 E-6	0.0626	26000
15	3.38 E-6	0.0691	28000
16	3.24 E-6	0.0758	30000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0030	1000
2	0.0043	3000
3	0.0068	5000
4	0.0093	7000
5	0.0126	9000
6	0.0167	11000
7	0.0222	13000
8	0.0286	15000
9	0.0340	17000
10	0.0400	19000
11	0.0467	21000
12	0.0528	23000
13	0.0594	25000
14	0.0658	27000
15	0.0725	29000
16	0.0790	31000

TABLE 181

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 6-L-18, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.5$ ,  $U_c = -2.67$ ,  $S=2.0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.2529	0.0008	36000	1000	8.32 E-7
1.2538	0.0008	38000	2000	4.16 E-7
1.2546	0.0008	40000	2000	4.16 E-7
1.2551	0.0006	42000	2000	2.78 E-7
1.2560	0.0008	44000	2000	4.16 E-7
1.2574	0.0014	46000	2000	6.94 E-7
1.2587	0.0014	48000	2000	6.94 E-7
1.2604	0.0017	50000	2000	8.32 E-7
1.2624	0.0019	52000	2000	9.71 E-7
1.2637	0.0014	54000	2000	6.94 E-7
1.2651	0.0014	56000	2000	6.94 E-7
1.2665	0.0014	58000	2000	6.94 E-7
1.2687	0.0022	60000	2000	1.11 E-6
1.2704	0.0017	62000	2000	8.32 E-7
1.2726	0.0022	64000	2000	1.11 E-6
1.2748	0.0022	66000	2000	1.11 E-6
1.2765	0.0017	68000	2000	8.32 E-7
1.2782	0.0017	70000	2000	8.32 E-7
RUN NO. 2				
1.2870	0.0011	78000	1000	1.11 E-6
1.2879	0.0008	80000	2000	4.16 E-7
1.2882	0.0003	82000	2000	1.39 E-7
1.2887	0.0006	84000	2000	2.77 E-7
1.2898	0.0011	86000	2000	5.55 E-7
1.2904	0.0006	88000	2000	2.78 E-7
1.2912	0.0008	90000	2000	4.16 E-7
1.2929	0.0017	92000	2000	8.32 E-7
1.2948	0.0019	94000	2000	9.71 E-7
1.2965	0.0017	96000	2000	8.32 E-7
1.2984	0.0019	98000	2000	9.71 E-7
1.3004	0.0019	100000	2000	9.71 E-7
1.3020	0.0017	102000	2000	8.32 E-7
1.3037	0.0017	104000	2000	8.32 E-7
1.3056	0.0019	106000	2000	9.71 E-7
1.3079	0.0022	108000	2000	1.11 E-6
1.3104	0.0025	110000	2000	1.25 E-6
1.3126	0.0022	112000	2000	1.11 E-6

TABLE 181 (continued)

## RUN NO. 3

1.3467	0.0011	143000	1000	1.11 E-6
1.3470	0.0003	145000	2000	1.39 E-7
1.3475	0.0006	147000	2000	2.77 E-7
1.3481	0.0006	149000	2000	2.78 E-7
1.3489	0.0008	151000	2000	4.16 E-7
1.3500	0.0011	153000	2000	5.55 E-7
1.3517	0.0017	155000	2000	8.32 E-7
1.3542	0.0025	157000	2000	1.25 E-6
1.3559	0.0017	159000	2000	8.32 E-7
1.3575	0.0017	161000	2000	8.33 E-7
1.3589	0.0014	163000	2000	6.94 E-7
1.3609	0.0019	165000	2000	9.71 E-7
1.3631	0.0022	167000	2000	1.11 E-6
1.3653	0.0022	169000	2000	1.11 E-6
1.3675	0.0022	171000	2000	1.11 E-6
1.3703	0.0028	173000	2000	1.39 E-6
1.3725	0.0022	175000	2000	1.11 E-6
1.3750	0.0025	177000	2000	1.25 E-6

## RUN NO. 4

1.3767	0.0017	178000	1000	1.67 E-6
1.3772	0.0006	180000	2000	2.77 E-7
1.3778	0.0006	182000	2000	2.78 E-7
1.3786	0.0008	184000	2000	4.16 E-7
1.3795	0.0008	186000	2000	4.16 E-7
1.3800	0.0006	188000	2000	2.77 E-7
1.3811	0.0011	190000	2000	5.55 E-7
1.3825	0.0014	192000	2000	6.94 E-7
1.3842	0.0017	194000	2000	8.32 E-7
1.3861	0.0019	196000	2000	9.71 E-7
1.3878	0.0017	198000	2000	8.32 E-7
1.3903	0.0025	200000	2000	1.25 E-6
1.3925	0.0022	202000	2000	1.11 E-6
1.3947	0.0022	204000	2000	1.11 E-6
1.3969	0.0022	206000	2000	1.11 E-6
1.3992	0.0022	208000	2000	1.11 E-6
1.4017	0.0025	210000	2000	1.25 E-6
1.4039	0.0022	212000	2000	1.11 E-6

TABLE 181 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	1.18 E-6	0.0006	500
2	3.12 E-7	0.0015	2000
3	2.77 E-7	0.0021	4000
4	3.12 E-7	0.0027	6000
5	4.51 E-7	0.0034	8000
6	4.51 E-7	0.0043	10000
7	6.24 E-7	0.0054	12000
8	9.02 E-7	0.0069	14000
9	9.02 E-7	0.0087	16000
10	8.33 E-7	0.0105	18000
11	7.98 E-7	0.0121	20000
12	9.71 E-7	0.0139	22000
13	1.04 E-6	0.0159	24000
14	9.71 E-7	0.0179	26000
15	1.08 E-6	0.0199	28000
16	1.18 E-6	0.0222	30000
17	1.11 E-6	0.0245	32000
18	1.08 E-6	0.0267	34000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0012	1000
2	0.0018	3000
3	0.0024	5000
4	0.0030	7000
5	0.0039	9000
6	0.0048	11000
7	0.0060	13000
8	0.0078	15000
9	0.0096	17000
10	0.0113	19000
11	0.0129	21000
12	0.0148	23000
13	0.0169	25000
14	0.0189	27000
15	0.0210	29000
16	0.0234	31000
17	0.0256	33000
18	0.0278	35000

TABLE 182

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 6-L-6, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.1$ ,  $U_c = -3.33$ ,  $S=2.5$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.5578	0.0045	9000	1000	4.48 E-6
0.5611	0.0034	13000	4000	8.40 E-7
0.5634	0.0022	17000	4000	5.60 E-7
0.5656	0.0022	21000	4000	5.60 E-7
0.5681	0.0025	25000	4000	6.30 E-7
0.5695	0.0014	27000	2000	7.00 E-7
0.5718	0.0022	29000	2000	1.12 E-6
0.5765	0.0048	31000	2000	2.38 E-6
0.5802	0.0036	33000	2000	1.82 E-6
0.5852	0.0050	35000	2000	2.52 E-6
0.5928	0.0076	37000	2000	3.78 E-6
0.5986	0.0059	39000	2000	2.94 E-6
0.6059	0.0073	41000	2000	3.64 E-6
0.6132	0.0073	43000	2000	3.64 E-6
0.6216	0.0084	45000	2000	4.20 E-6
0.6294	0.0078	47000	2000	3.92 E-6
0.6364	0.0070	49000	2000	3.50 E-6
0.6460	0.0095	51000	2000	4.76 E-6
0.6532	0.0073	53000	2000	3.64 E-6
0.6597	0.0064	55000	2000	3.22 E-6
0.6686	0.0090	57000	2000	4.48 E-6
0.6779	0.0092	59000	2000	4.62 E-6
0.6854	0.0076	61000	2000	3.78 E-6

TABLE 182 (continued)

RUN NO. 2

0.7426	0.0036	74000	1000	3.64 E-6
0.7459	0.0034	78000	4000	8.40 E-7
0.7487	0.0028	82000	4000	7.00 E-7
0.7512	0.0025	86000	4000	6.30 E-7
0.7543	0.0031	90000	4000	7.70 E-7
0.7580	0.0036	92000	2000	1.82 E-6
0.7610	0.0031	94000	2000	1.54 E-6
0.7650	0.0039	96000	2000	1.96 E-6
0.7700	0.0050	98000	2000	2.52 E-6
0.7762	0.0062	100000	2000	3.08 E-6
0.7840	0.0078	102000	2000	3.92 E-6
0.7904	0.0064	104000	2000	3.22 E-6
0.7986	0.0081	106000	2000	4.06 E-6
0.8061	0.0076	108000	2000	3.78 E-6
0.8137	0.0076	110000	2000	3.78 E-6
0.8221	0.0084	112000	2000	4.20 E-6
0.8299	0.0078	114000	2000	3.92 E-6
0.8389	0.0090	116000	2000	4.48 E-6
0.8467	0.0078	118000	2000	3.92 E-6
0.8560	0.0092	120000	2000	4.62 E-6
0.8641	0.0081	122000	2000	4.06 E-6
0.8716	0.0076	124000	2000	3.78 E-6
0.8806	0.0090	126000	2000	4.48 E-6

RUN NO. 3

0.8924	0.0036	129000	1000	3.64 E-6
0.8954	0.0031	133000	4000	7.70 E-7
0.8971	0.0017	137000	4000	4.20 E-7
0.8996	0.0025	141000	4000	6.30 E-7
0.9024	0.0028	145000	4000	7.00 E-7
0.9038	0.0014	147000	2000	7.00 E-7
0.9066	0.0028	149000	2000	1.40 E-6
0.9108	0.0042	151000	2000	2.10 E-6
0.9145	0.0036	153000	2000	1.82 E-6
0.9201	0.0056	155000	2000	2.80 E-6
0.9265	0.0064	157000	2000	3.22 E-6
0.9313	0.0048	159000	2000	2.38 E-6
0.9397	0.0084	161000	2000	4.20 E-6
0.9470	0.0073	163000	2000	3.64 E-6
0.9554	0.0084	165000	2000	4.20 E-6
0.9646	0.0092	167000	2000	4.62 E-6
0.9741	0.0095	169000	2000	4.76 E-6
0.9825	0.0084	171000	2000	4.20 E-6
0.9923	0.0098	173000	2000	4.90 E-6
1.0007	0.0084	175000	2000	4.20 E-6
1.0088	0.0081	177000	2000	4.06 E-6
1.0167	0.0078	179000	2000	3.92 E-6
1.0265	0.0098	181000	2000	4.90 E-6

(442)

TABLE 182 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	3.92 E-6	0.0020	500
2	8.17 E-7	0.0056	3000
3	5.60 E-7	0.0083	7000
4	6.07 E-7	0.0106	11000
5	7.00 E-7	0.0133	15000
6	1.07 E-6	0.0157	18000
7	1.35 E-6	0.0182	20000
8	2.15 E-6	0.0217	22000
9	2.05 E-6	0.0259	24000
10	2.80 E-6	0.0307	26000
11	3.64 E-6	0.0371	28000
12	2.85 E-6	0.0436	30000
13	3.97 E-6	0.0504	32000
14	3.69 E-6	0.0581	34000
15	4.06 E-6	0.0658	36000
16	4.25 E-6	0.0742	38000
17	4.06 E-6	0.0825	40000
18	4.48 E-6	0.0910	42000
19	4.15 E-6	0.0996	44000
20	4.01 E-6	0.1078	46000
21	4.20 E-6	0.1160	48000
22	4.11 E-6	0.1243	50000
23	4.39 E-6	0.1328	52000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0039	1000
2	0.0072	5000
3	0.0094	9000
4	0.0119	13000
5	0.0147	17000
6	0.0168	19000
7	0.0195	21000
8	0.0238	23000
9	0.0279	25000
10	0.0335	27000
11	0.0408	29000
12	0.0465	31000
13	0.0544	33000
14	0.0618	35000
15	0.0699	37000
16	0.0784	39000
17	0.0865	41000
18	0.0955	43000
19	0.1038	45000
20	0.1118	47000
21	0.1202	49000
22	0.1284	51000
23	0.1372	53000

(443)



TABLE 183

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 6-1-6, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.3$ ,  $U_c = -3.33$ ,  $S=2.5$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.1127	0.0022	5000	1000	2.24 E-6
1.1150	0.0022	9000	4000	5.60 E-7
1.1161	0.0011	13000	4000	2.80 E-7
1.1172	0.0011	17000	4000	2.80 E-7
1.1189	0.0017	21000	4000	4.20 E-7
1.1228	0.0039	25000	4000	9.80 E-7
1.1250	0.0022	27000	2000	1.12 E-6
1.1267	0.0017	29000	2000	8.40 E-7
1.1292	0.0025	31000	2000	1.26 E-6
1.1329	0.0036	33000	2000	1.82 E-6
1.1374	0.0045	35000	2000	2.24 E-6
1.1424	0.0050	37000	2000	2.52 E-6
1.1474	0.0050	39000	2000	2.52 E-6
1.1542	0.0067	41000	2000	3.36 E-6
1.1592	0.0050	43000	2000	2.52 E-6
1.1651	0.0059	45000	2000	2.94 E-6
1.1710	0.0059	47000	2000	2.94 E-6
1.1766	0.0056	49000	2000	2.80 E-6
1.1822	0.0056	51000	2000	2.80 E-6
1.1883	0.0062	53000	2000	3.08 E-6
1.1950	0.0067	55000	2000	3.36 E-6
1.2006	0.0056	57000	2000	2.80 E-6
1.2071	0.0064	59000	2000	3.22 E-6
1.2132	0.0062	61000	2000	3.08 E-6

TABLE 183 (continued)

RUN NO. 2

1.2160	0.0028	62000	1000	2.80 E-6
1.2169	0.0008	66000	4000	2.10 E-7
1.2191	0.0022	70000	4000	5.60 E-7
1.2208	0.0017	74000	4000	4.20 E-7
1.2230	0.0022	78000	4000	5.60 E-7
1.2250	0.0020	82000	4000	4.90 E-7
1.2264	0.0014	84000	2000	7.00 E-7
1.2281	0.0017	86000	2000	8.40 E-7
1.2298	0.0017	88000	2000	8.40 E-7
1.2320	0.0022	90000	2000	1.12 E-6
1.2354	0.0034	92000	2000	1.68 E-6
1.2404	0.0050	94000	2000	2.52 E-6
1.2440	0.0036	96000	2000	1.82 E-6
1.2485	0.0045	98000	2000	2.24 E-6
1.2533	0.0048	100000	2000	2.38 E-6
1.2597	0.0064	102000	2000	3.22 E-6
1.2656	0.0059	104000	2000	2.94 E-6
1.2709	0.0053	106000	2000	2.66 E-6
1.2754	0.0045	108000	2000	2.24 E-6
1.2810	0.0056	110000	2000	2.80 E-6
1.2880	0.0070	112000	2000	3.50 E-6
1.2947	0.0067	114000	2000	3.36 E-6
1.3012	0.0064	116000	2000	3.22 E-6
1.3084	0.0073	118000	2000	3.64 E-6

RUN NO. 3

1.4300	0.0025	161000	1000	2.52 E-6
1.4325	0.0025	165000	4000	6.30 E-7
1.4330	0.0006	169000	4000	1.40 E-7
1.4344	0.0014	173000	4000	3.50 E-7
1.4361	0.0017	177000	4000	4.20 E-7
1.4395	0.0034	181000	4000	8.40 E-7
1.4420	0.0025	183000	2000	1.26 E-6
1.4440	0.0020	185000	2000	9.80 E-7
1.4476	0.0036	187000	2000	1.82 E-6
1.4515	0.0039	189000	2000	1.96 E-6
1.4546	0.0031	191000	2000	1.54 E-6
1.4580	0.0034	193000	2000	1.68 E-6
1.4627	0.0048	195000	2000	2.38 E-6
1.4672	0.0045	197000	2000	2.24 E-6
1.4722	0.0050	199000	2000	2.52 E-6
1.4778	0.0056	201000	2000	2.80 E-6
1.4848	0.0070	203000	2000	3.50 E-6
1.4910	0.0062	205000	2000	3.08 E-6
1.4966	0.0056	207000	2000	2.80 E-6
1.5025	0.0059	209000	2000	2.94 E-6
1.5084	0.0059	211000	2000	2.94 E-6
1.5142	0.0059	213000	2000	2.94 E-6
1.5212	0.0070	215000	2000	3.50 E-6
1.5277	0.0064	217000	2000	3.22 E-6

(445)

TABLE 183 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	2.52 E-6	0.0013	500
2	4.67 E-7	0.0035	3000
3	3.27 E-7	0.0050	7000
4	3.50 E-7	0.0064	11000
5	4.67 E-7	0.0080	15000
6	7.70 E-7	0.0105	19000
7	1.03 E-6	0.0131	22000
8	8.87 E-7	0.0150	24000
9	1.31 E-6	0.0172	26000
10	1.63 E-6	0.0201	28000
11	1.82 E-6	0.0236	30000
12	2.24 E-6	0.0276	32000
13	2.24 E-6	0.0321	34000
14	2.61 E-6	0.0370	36000
15	2.47 E-6	0.0420	38000
16	2.99 E-6	0.0475	40000
17	3.13 E-6	0.0536	42000
18	2.85 E-6	0.0596	44000
19	2.61 E-6	0.0651	46000
20	2.94 E-6	0.0706	48000
21	3.27 E-6	0.0768	50000
22	3.03 E-6	0.0831	52000
23	3.31 E-6	0.0895	54000
24	3.31 E-6	0.0961	56000

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0025	1000
2	0.0044	5000
3	0.0057	9000
4	0.0071	13000
5	0.0090	17000
6	0.0120	21000
7	0.0141	23000
8	0.0159	25000
9	0.0185	27000
10	0.0217	29000
11	0.0254	31000
12	0.0299	33000
13	0.0343	35000
14	0.0396	37000
15	0.0445	39000
16	0.0505	41000
17	0.0567	43000
18	0.0624	45000
19	0.0677	47000
20	0.0735	49000
21	0.0801	51000
22	0.0861	53000
23	0.0928	55000
24	0.0994	57000

(446)

TABLE 184

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 2-L-2, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.5$ ,  $S=2.5$ ,  $U_c = -3.33$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.5197	0.0011	9000	1000	1.12 E-6
0.5239	0.0042	19000	10000	4.70 E-7
0.5292	0.0053	29000	10000	5.32 E-7
0.5314	0.0023	33000	4000	5.60 E-7
0.5356	0.0042	37000	4000	1.05 E-6
0.5384	0.0028	41000	4000	7.00 E-7
0.5415	0.0031	45000	4000	7.70 E-7
0.5449	0.0034	49000	4000	8.40 E-7
0.5482	0.0034	53000	4000	8.40 E-7
0.5516	0.0034	57000	4000	8.40 E-7
0.5552	0.0036	61000	4000	9.10 E-7
0.5583	0.0031	65000	4000	7.70 E-7
0.5606	0.0022	67000	2000	1.12 E-6
0.5631	0.0025	69000	2000	1.26 E-6
0.5653	0.0022	71000	2000	1.12 E-6
0.5664	0.0011	73000	2000	5.60 E-7
0.5684	0.0020	75000	2000	9.80 E-7
0.5709	0.0025	77000	2000	1.26 E-6
0.5732	0.0022	79000	2000	1.12 E-6
0.5757	0.0025	81000	2000	1.26 E-6
0.5779	0.0022	83000	2000	1.12 E-6
0.5799	0.0020	85000	2000	9.80 E-7
0.5821	0.0022	87000	2000	1.12 E-6
0.5846	0.0025	89000	2000	1.26 E-6
0.5869	0.0022	91000	2000	1.12 E-6
0.5891	0.0022	93000	2000	1.12 E-6

TABLE 184 (continued)

RUN NO. 2

0.6079	0.0011	110000	1000	1.12 E-6
0.6115	0.0036	120000	10000	3.64 E-7
0.6149	0.0034	130000	10000	3.36 E-7
0.6166	0.0017	134000	4000	4.20 E-7
0.6180	0.0014	138000	4000	3.50 E-7
0.6205	0.0025	142000	4000	6.30 E-7
0.6236	0.0031	146000	4000	7.70 E-7
0.6266	0.0031	150000	4000	7.70 E-7
0.6297	0.0031	154000	4000	7.70 E-7
0.6339	0.0042	158000	4000	1.05 E-6
0.6378	0.0039	162000	4000	9.80 E-7
0.6420	0.0042	166000	4000	1.05 E-6
0.6440	0.0020	168000	2000	9.80 E-7
0.6471	0.0031	170000	2000	1.54 E-6
0.6490	0.0020	172000	2000	9.80 E-7
0.6510	0.0020	174000	2000	9.80 E-7
0.6530	0.0020	176000	2000	9.80 E-7
0.6560	0.0031	178000	2000	1.54 E-6
0.6583	0.0022	180000	2000	1.12 E-6
0.6602	0.0020	182000	2000	9.80 E-7
0.6628	0.0025	184000	2000	1.26 E-6
0.6647	0.0020	186000	2000	9.80 E-7
0.6675	0.0028	188000	2000	1.40 E-6
0.6698	0.0022	190000	2000	1.12 E-6
0.6723	0.0025	192000	2000	1.26 E-6
0.6745	0.0022	194000	2000	1.12 E-6

TABLE 184 (continued)

RUN NO. 3

0.6927	0.0008	211000	1000	8.40 E-7
0.6955	0.0028	221000	10000	2.80 E-7
0.6980	0.0025	231000	10000	2.52 E-7
0.6994	0.0014	235000	4000	3.50 E-7
0.7014	0.0020	239000	4000	4.90 E-7
0.7031	0.0017	243000	4000	4.20 E-7
0.7048	0.0017	247000	4000	4.20 E-7
0.7073	0.0025	251000	4000	6.30 E-7
0.7098	0.0025	255000	4000	6.30 E-7
0.7137	0.0039	259000	4000	9.80 E-7
0.7179	0.0042	263000	4000	1.05 E-6
0.7218	0.0039	267000	4000	9.80 E-7
0.7238	0.0020	269000	2000	9.80 E-7
0.7258	0.0020	271000	2000	9.80 E-7
0.7280	0.0022	273000	2000	1.12 E-6
0.7305	0.0025	275000	2000	1.26 E-6
0.7328	0.0022	277000	2000	1.12 E-6
0.7344	0.0017	279000	2000	8.40 E-7
0.7367	0.0022	281000	2000	1.12 E-6
0.7395	0.0028	283000	2000	1.40 E-6
0.7426	0.0031	285000	2000	1.54 E-6
0.7442	0.0017	287000	2000	8.40 E-7
0.7459	0.0017	289000	2000	8.40 E-7
0.7482	0.0022	291000	2000	1.12 E-6
0.7515	0.0034	293000	2000	1.68 E-6
0.7543	0.0028	295000	2000	1.40 E-6

TABLE 184 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	1.03 E-6	0.0005	500
2	3.71 E-7	0.0028	6000
3	3.73 E-7	0.0064	16000
4	4.43 E-7	0.0092	23000
5	6.30 E-7	0.0114	27000
6	5.83 E-7	0.0138	31000
7	6.53 E-7	0.0163	35000
8	7.47 E-7	0.0191	39000
9	7.47 E-7	0.0221	43000
10	9.57 E-7	0.0255	47000
11	9.80 E-7	0.0294	51000
12	9.33 E-7	0.0332	55000
13	1.03 E-6	0.0361	58000
14	1.26 E-6	0.0384	60000
15	1.07 E-6	0.0407	62000
16	9.33 E-7	0.0427	64000
17	1.03 E-6	0.0446	66000
18	1.21 E-6	0.0469	68000
19	1.12 E-6	0.0492	70000
20	1.21 E-6	0.0515	72000
21	1.31 E-6	0.0541	74000
22	9.33 E-7	0.0563	76000
23	1.12 E-6	0.0584	78000
24	1.17 E-6	0.0606	80000
25	1.35 E-6	0.0632	82000
26	1.21 E-6	0.0657	84000

TABLE 184 (continued)

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0010	1000
2	0.0046	11000
3	0.0083	21000
4	0.0101	25000
5	0.0126	29000
6	0.0149	33000
7	0.0176	37000
8	0.0206	41000
9	0.0236	45000
10	0.0274	49000
11	0.0313	53000
12	0.0351	57000
13	0.0371	59000
14	0.0396	61000
15	0.0417	63000
16	0.0436	65000
17	0.0457	67000
18	0.0481	69000
19	0.0503	71000
20	0.0528	73000
21	0.0554	75000
22	0.0572	77000
23	0.0595	79000
24	0.0618	81000
25	0.0645	83000
26	0.0669	85000



TABLE 185

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 2-L-2, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.1$ ,  $S=3.0$ ,  $U_c = -4.0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.8540	0.0045	5000	1000	4.48 E-6
0.8596	0.0056	15000	10000	5.60 E-7
0.8618	0.0022	25000	10000	2.24 E-7
0.8635	0.0017	35000	10000	1.68 E-7
0.8674	0.0039	45000	10000	3.92 E-7
0.8697	0.0022	53000	8000	2.80 E-7
0.8730	0.0034	61000	8000	4.20 E-7
0.8781	0.0050	69000	8000	6.30 E-7
0.8915	0.0134	77000	8000	1.68 E-6
0.8949	0.0034	79000	2000	1.68 E-6
0.8999	0.0050	81000	2000	2.52 E-6
0.9061	0.0062	83000	2000	3.08 E-6
0.9106	0.0045	85000	2000	2.24 E-6
0.9162	0.0056	87000	2000	2.80 E-6
0.9226	0.0064	89000	2000	3.22 E-6
0.9302	0.0076	91000	2000	3.78 E-6
0.9366	0.0064	93000	2000	3.22 E-6
0.9447	0.0081	95000	2000	4.06 E-6
0.9534	0.0087	97000	2000	4.34 E-6
0.9610	0.0076	99000	2000	3.78 E-6
0.9688	0.0078	101000	2000	3.92 E-6
0.9764	0.0076	103000	2000	3.78 E-6
0.9856	0.0092	105000	2000	4.62 E-6
0.9932	0.0076	107000	2000	3.78 E-6
1.0002	0.0070	109000	2000	3.50 E-6
1.0091	0.0090	111000	2000	4.48 E-6
1.0189	0.0098	113000	2000	4.90 E-6
1.0276	0.0087	115000	2000	4.34 E-6
1.0354	0.0078	117000	2000	3.92 E-6

TABLE 185 (continued)

RUN NO. 2

1.0399	0.0045	118000	1000	4.48 E-6
1.0441	0.0042	128000	10000	4.20 E-7
1.0461	0.0020	138000	10000	1.96 E-7
1.0483	0.0022	148000	10000	2.24 E-7
1.0508	0.0025	158000	10000	2.52 E-7
1.0520	0.0011	166000	8000	1.40 E-7
1.0536	0.0017	174000	8000	2.10 E-7
1.0556	0.0020	182000	8000	2.45 E-7
1.0601	0.0045	190000	8000	5.60 E-7
1.0618	0.0017	192000	2000	8.40 E-7
1.0657	0.0039	194000	2000	1.96 E-6
1.0682	0.0025	196000	2000	1.26 E-6
1.0713	0.0031	198000	2000	1.54 E-6
1.0749	0.0036	200000	2000	1.82 E-6
1.0797	0.0048	202000	2000	2.38 E-6
1.0839	0.0042	204000	2000	2.10 E-6
1.0889	0.0050	206000	2000	2.52 E-6
1.0942	0.0053	208000	2000	2.66 E-6
1.1010	0.0067	210000	2000	3.36 E-6
1.1066	0.0056	212000	2000	2.80 E-6
1.1161	0.0095	214000	2000	4.76 E-6
1.1228	0.0067	216000	2000	3.36 E-6
1.1309	0.0081	218000	2000	4.06 E-6
1.1390	0.0081	220000	2000	4.06 E-6
1.1472	0.0081	222000	2000	4.06 E-6
1.1536	0.0064	224000	2000	3.22 E-6
1.1617	0.0081	226000	2000	4.06 E-6
1.1701	0.0084	228000	2000	4.20 E-6
1.1794	0.0092	230000	2000	4.62 E-6

TABLE 185 (continued)

RUN NO. 3

1.2835	0.0050	254000	1000	5.04 E-6
1.2886	0.0050	264000	10000	5.04 E-7
1.2902	0.0017	274000	10000	1.68 E-7
1.2919	0.0017	284000	10000	1.68 E-7
1.2942	0.0022	294000	10000	2.24 E-7
1.2964	0.0022	302000	8000	2.80 E-7
1.2986	0.0022	310000	8000	2.80 E-7
1.3048	0.0062	318000	8000	7.70 E-7
1.3216	0.0168	326000	8000	2.10 E-6
1.3278	0.0062	328000	2000	3.08 E-6
1.3345	0.0067	330000	2000	3.36 E-6
1.3412	0.0067	332000	2000	3.36 E-6
1.3474	0.0062	334000	2000	3.08 E-6
1.3549	0.0076	336000	2000	3.78 E-6
1.3619	0.0070	338000	2000	3.50 E-6
1.3698	0.0078	340000	2000	3.92 E-6
1.3770	0.0073	342000	2000	3.64 E-6
1.3854	0.0084	344000	2000	4.20 E-6
1.3941	0.0087	346000	2000	4.34 E-6
1.4034	0.0092	348000	2000	4.62 E-6
1.4118	0.0084	350000	2000	4.20 E-6
1.4202	0.0084	352000	2000	4.20 E-6
1.4280	0.0078	354000	2000	3.92 E-6
1.4375	0.0095	356000	2000	4.76 E-6
1.4465	0.0090	358000	2000	4.48 E-6
1.4554	0.0090	360000	2000	4.48 E-6
1.4633	0.0078	362000	2000	3.92 E-6
1.4728	0.0095	364000	2000	4.76 E-6
1.4823	0.0095	366000	2000	4.76 E-6

TABLE 185 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	4.67 E-6	0.0023	500
2	4.95 E-7	0.0071	6000
3	1.96 E-7	0.0106	16000
4	1.87 E-7	0.0125	26000
5	2.89 E-7	0.0149	36000
6	2.33 E-7	0.0173	45000
7	3.03 E-7	0.0194	53000
8	5.48 E-7	0.0228	61000
9	1.45 E-6	0.0308	69000
10	1.87 E-6	0.0385	74000
11	2.61 E-6	0.0429	76000
12	2.57 E-6	0.0481	78000
13	2.29 E-6	0.0530	80000
14	2.80 E-6	0.0581	82000
15	3.03 E-6	0.0639	84000
16	3.27 E-6	0.0702	86000
17	3.13 E-6	0.0766	88000
18	3.64 E-6	0.0833	90000
19	4.01 E-6	0.0910	92000
20	3.73 E-6	0.0987	94000
21	4.29 E-6	0.1068	96000
22	3.78 E-6	0.1148	98000
23	4.20 E-6	0.1228	100000
24	4.20 E-6	0.1312	102000
25	4.01 E-6	0.1394	104000
26	4.06 E-6	0.1475	106000
27	4.29 E-6	0.1559	108000
28	4.43 E-6	0.1646	110000
29	4.43 E-6	0.1735	112000

TABLE 185 (continued)

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0047	1000
2	0.0096	11000
3	0.0116	21000
4	0.0134	31000
5	0.0163	41000
6	0.0182	49000
7	0.0206	57000
8	0.0250	65000
9	0.0366	73000
10	0.0403	75000
11	0.0455	77000
12	0.0507	79000
13	0.0553	81000
14	0.0609	83000
15	0.0669	85000
16	0.0735	87000
17	0.0797	89000
18	0.0870	91000
19	0.0950	93000
20	0.1025	95000
21	0.1111	97000
22	0.1186	99000
23	0.1270	101000
24	0.1354	103000
25	0.1435	105000
26	0.1516	107000
27	0.1602	109000
28	0.1690	111000
29	0.1779	113000

TABLE 186

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 2-L-15, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.1$ ,  $U_c=-4.67$ ,  $S=3.5$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.9237	0.0070	4000	2000	3.50 E-6
0.9344	0.0106	54000	50000	2.13 E-7
0.9408	0.0064	104000	50000	1.29 E-7
0.9442	0.0034	154000	50000	6.72 E-8
0.9492	0.0050	204000	50000	1.01 E-7
0.9537	0.0045	254000	50000	8.96 E-8
0.9685	0.0092	304000	50000	1.85 E-7
1.2880	0.3195	354000	50000	6.39 E-6

Test performed to zero-in on overload shut-off ratio. Test terminated prior to reaching  $(da/dN)_c$ .

TABLE 187

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 2-L-15, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.1$ ,  $U_c = -4.8$ ,  $S=3.6$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.5030	0.0062	10000	1000	6.16 E-6
1.5126	0.0095	60000	50000	1.90 E-7
1.5154	0.0028	110000	50000	5.60 E-8
1.5187	0.0034	160000	50000	6.72 E-8
1.5204	0.0017	210000	50000	3.36 E-8
1.5215	0.0011	260000	50000	2.24 E-8
1.5235	0.0020	310000	50000	3.92 E-8
1.5252	0.0017	360000	50000	3.36 E-8
1.5277	0.0025	410000	50000	5.04 E-8
1.5288	0.0011	460000	50000	2.24 E-8
1.5296	0.0008	510000	50000	1.68 E-8
1.5322	0.0025	560000	50000	5.04 E-8
1.5350	0.0028	610000	50000	5.60 E-8
1.5389	0.0039	660000	50000	7.84 E-8
1.5422	0.0034	710000	50000	6.72 E-8
1.5467	0.0045	760000	50000	8.96 E-8
1.5523	0.0056	810000	50000	1.12 E-7
1.5585	0.0062	860000	50000	1.23 E-7
1.5708	0.0123	910000	50000	2.46 E-7
1.6117	0.0409	960000	50000	8.18 E-7

Test performed to zero-in on overload shut-off ratio.  
 Test terminated prior to reaching  $(da/dN)_c$ .

TABLE 188

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 4-L-1, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.1$ ,  $U_c=-4.93$ ,  $S=3.7$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.4986	0.0056	9000	1000	5.60 E-6
1.5014	0.0028	38750	29750	9.41 E-8
1.5053	0.0039	88750	50000	7.84 E-8
1.5053	0.0000	138750	50000	0.00 E+0
1.5053	0.0000	188750	50000	0.00 E+0
1.5053	0.0000	238750	50000	0.00 E+0
1.5053	0.0000	288750	50000	0.00 E+0
1.5072	0.0020	338750	50000	3.92 E-8
1.5072	0.0000	388750	50000	0.00 E+0
1.5075	0.0003	438750	50000	5.60 E-9
1.5075	0.0000	488750	50000	0.00 E+0
1.5075	0.0000	538750	50000	0.00 E+0
1.5078	0.0003	588750	50000	5.60 E-9
1.5081	0.0003	638750	50000	5.60 E-9
1.5086	0.0006	688750	50000	1.12 E-8
1.5086	0.0000	738750	50000	0.00 E+0
1.5089	0.0003	788750	50000	5.60 E-9
1.5089	0.0000	838750	50000	0.00 E+0
1.5089	0.0000	888750	50000	0.00 E+0
1.5089	0.0000	938750	50000	0.00 E+0
1.5089	0.0000	988750	50000	0.00 E+0
1.5089	0.0000	1038750	50000	0.00 E+0
1.5089	0.0000	1088750	50000	0.00 E+0
1.5089	0.0000	1138750	50000	0.00 E+0
1.5089	0.0000	1188750	50000	0.00 E+0
1.5089	0.0000	1238750	50000	0.00 E+0
1.5089	0.0000	1288750	50000	0.00 E+0

No crack growth,  $S=3.7$  considered to be overload shut-off ratio.



TABLE 189

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 6-L-16, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.3$ ,  $U_c=-4$ ,  $S=3$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.5219	0.0034	13000	1000	3.36 E-6
0.5309	0.0090	33000	20000	4.48 E-7
0.5365	0.0056	53000	20000	2.80 E-7
0.5432	0.0067	68000	15000	4.40 E-7
0.5494	0.0062	78000	10000	6.16 E-7
0.5592	0.0098	88000	10000	9.30 E-7
0.5718	0.0126	96000	8000	1.57 E-6
0.5813	0.0095	104000	8000	1.19 E-6
0.5942	0.0129	112000	8000	1.61 E-6
0.6082	0.0140	120000	8000	1.75 E-6
0.6244	0.0162	128000	8000	2.03 E-6
0.6429	0.0185	136000	8000	2.31 E-6
0.6614	0.0185	144000	8000	2.31 E-6
0.6832	0.0218	152000	8000	2.73 E-6
0.6933	0.0100	156000	4000	2.52 E-6
0.7036	0.0103	160000	4000	2.59 E-6
0.7154	0.0117	164000	4000	2.94 E-6
0.7252	0.0098	168000	4000	2.45 E-6
0.7375	0.0123	172000	4000	3.00 E-6
0.7431	0.0056	174000	2000	2.80 E-6
0.7493	0.0062	176000	2000	3.00 E-6
0.7543	0.0050	178000	2000	2.52 E-6
0.7610	0.0067	180000	2000	3.36 E-6
0.7661	0.0050	182000	2000	2.52 E-6
0.7725	0.0064	184000	2000	3.22 E-6
0.7784	0.0059	186000	2000	2.94 E-6
0.7843	0.0064	188000	2000	3.22 E-6
0.7896	0.0043	190000	2000	2.38 E-6
0.7960	0.0064	192000	2000	3.22 E-6

TABLE 189 (continued)

RUN NO. 2

0.8646	0.0045	214750	1000	4.48 E-6
0.8702	0.0056	234750	20000	2.80 E-7
0.8753	0.0050	254750	20000	2.52 E-7
0.8781	0.0028	269750	15000	1.87 E-7
0.8814	0.0034	279750	10000	3.36 E-7
0.8868	0.0053	289750	10000	5.32 E-7
0.8932	0.0064	297750	8000	8.05 E-7
0.9016	0.0084	305750	8000	1.05 E-6
0.9145	0.0129	313750	8000	1.61 E-6
0.9304	0.0160	321750	8000	2.00 E-6
0.9442	0.0137	329750	8000	1.72 E-6
0.9654	0.0213	337750	8000	2.66 E-6
0.9864	0.0210	345750	8000	2.63 E-6
1.0074	0.0210	353750	8000	2.63 E-6
1.0192	0.0113	357750	4000	2.94 E-6
1.0298	0.0106	361750	4000	2.66 E-6
1.0403	0.0109	365750	4000	2.73 E-6
1.0509	0.0132	369750	4000	3.29 E-6
1.0631	0.0112	373750	4000	2.80 E-6
1.0704	0.0053	375750	2000	2.66 E-6
1.0763	0.0059	377750	2000	2.94 E-6
1.0819	0.0056	379750	2000	2.80 E-6
1.0881	0.0062	381750	2000	3.08 E-6
1.0937	0.0056	383750	2000	2.80 E-6
1.0993	0.0056	385750	2000	2.80 E-6
1.1054	0.0062	387750	2000	3.08 E-6
1.1108	0.0053	389750	2000	2.66 E-6
1.1158	0.0050	391750	2000	2.52 E-6
1.1214	0.0056	393750	2000	2.80 E-6

TABLE 189 (continued)

RUN NO. 3

1.5350	0.0036	127000	1000	3.64 E-6
1.5394	0.0045	147000	20000	2.24 E-7
1.5417	0.0022	167000	20000	1.12 E-7
1.5439	0.0022	182000	15000	1.49 E-7
1.5450	0.0011	192000	10000	1.12 E-7
1.5462	0.0011	202000	10000	1.12 E-7
1.5473	0.0011	210000	8000	1.40 E-7
1.5484	0.0011	218000	8000	1.40 E-7
1.5495	0.0011	226000	8000	1.40 E-7
1.5523	0.0028	234000	8000	3.50 E-7
1.5574	0.0050	242000	8000	6.30 E-7
1.5630	0.0056	250000	8000	7.00 E-7
1.5725	0.0095	258000	8000	1.19 E-6
1.5859	0.0078	266000	8000	9.80 E-7
1.5949	0.0090	270000	4000	2.24 E-6
1.6022	0.0073	274000	4000	1.82 E-6
1.6094	0.0073	278000	4000	1.82 E-6
1.6173	0.0078	282000	4000	1.96 E-6
1.6279	0.0106	286000	4000	2.66 E-6
1.6324	0.0045	288000	2000	2.24 E-6
1.6336	0.0062	290000	2000	3.03 E-6
1.6436	0.0050	292000	2000	2.52 E-6
1.6451	0.0045	294000	2000	2.24 E-6
1.6526	0.0045	296000	2700	2.24 E-6
1.6576	0.0050	298000	2000	2.52 E-6
1.6626	0.0050	300000	2000	2.52 E-6
1.6682	0.0056	302000	2000	2.80 E-6
1.6733	0.0050	304000	2000	2.52 E-6
1.6789	0.0056	306000	2000	2.80 E-6

TABLE 189 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	3.83 E-6	0.0019	500
2	3.17 E-7	0.0070	11000
3	2.15 E-7	0.0123	31000
4	2.61 E-7	0.0164	43500
5	3.55 E-7	0.0202	61000
6	5.41 E-7	0.0247	71000
7	8.38 E-7	0.0307	80000
8	7.93 E-7	0.0373	88000
9	1.12 E-6	0.0449	96000
10	1.37 E-6	0.0549	104000
11	1.46 E-6	0.0662	112000
12	1.89 E-6	0.0795	120000
13	2.04 E-6	0.0953	128000
14	2.11 E-6	0.1119	136000
15	2.57 E-6	0.1255	142000
16	2.36 E-6	0.1353	146000
17	2.50 E-6	0.1450	150000
18	2.57 E-6	0.1551	154000
19	2.85 E-6	0.1659	158000
20	2.57 E-6	0.1742	161000
21	3.03 E-6	0.1798	163000
22	2.61 E-6	0.1854	165000
23	2.89 E-6	0.1909	167000
24	2.52 E-6	0.1963	169000
25	2.85 E-6	0.2017	171000
26	2.85 E-6	0.2074	173000
27	2.89 E-6	0.2131	175000
28	2.47 E-6	0.2185	177000
29	2.94 E-6	0.2239	179000

TABLE 189(continued)

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0038	1000
2	0.0102	21000
3	0.0145	41000
4	0.0184	56000
5	0.0220	66000
6	0.0274	76000
7	0.0341	84000
8	0.0404	92000
9	0.0494	100000
10	0.0603	108000
11	0.0720	116000
12	0.0871	124000
13	0.1035	132000
14	0.1203	140000
15	0.1306	144000
16	0.1400	148000
17	0.1499	152000
18	0.1602	156000
19	0.1716	160000
20	0.1767	162000
21	0.1828	164000
22	0.1880	166000
23	0.1938	168000
24	0.1988	170000
25	0.2045	172000
26	0.2102	174000
27	0.2160	176000
28	0.2210	178000
29	0.2268	180000

TABLE 190

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 3-L-5, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.3$ ,  $U_c=-4.67$ ,  $S=3.5$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.5852	0.0039	16500	1000	3.92 E-6
0.5964	0.0112	66500	50000	2.24 E-7
0.6028	0.0064	116500	50000	1.29 E-7
0.6082	0.0053	166500	50000	1.06 E-7
0.6177	0.0095	216500	50000	1.90 E-7
0.6406	0.0230	266500	50000	4.59 E-7
0.6490	0.0084	276500	10000	8.40 E-7
0.6572	0.0081	286500	10000	8.12 E-7

Test performed to zero-in on overload shut-off ratio. Test terminated prior to reaching  $(da/dN)_c$ .

TABLE 191

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 3-L-5, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.3$ ,  $U_c = -4.8$ ,  $S=3.6$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.8002	0.0028	7000	1000	2.80 E-6
0.8064	0.0062	57000	50000	1.23 E-7
0.8086	0.0022	107000	50000	4.48 E-8
0.8114	0.0028	157000	50000	5.60 E-8
0.8137	0.0022	207000	50000	4.48 E-8
0.8140	0.0003	257000	50000	5.60 E-9
0.8142	0.0003	307000	50000	5.60 E-9
0.8142	0.0000	357000	50000	0.00 E+0
0.8142	0.0000	407000	50000	0.00 E+0
0.8142	0.0000	457000	50000	0.00 E+0
0.8142	0.0000	507000	50000	0.00 E+0
0.8156	0.0014	557000	50000	2.80 E-8
0.8159	0.0003	607000	50000	5.60 E-9
0.8165	0.0006	657000	50000	1.12 E-8
0.8182	0.0017	707000	50000	3.36 E-8
0.8187	0.0006	757000	50000	1.12 E-8
0.8198	0.0011	807000	50000	2.24 E-8
0.8204	0.0006	857000	50000	1.12 E-8
0.8215	0.0011	907000	50000	2.24 E-8
0.8215	0.0000	957000	50000	0.00 E+0
0.8215	0.0000	1007000	50000	0.00 E+0
0.8215	0.0000	1057000	50000	0.00 E+0
0.8215	0.0000	1107000	50000	0.00 E+0

$S=3.6$  considered to be within 0.1 of overload shut-off ratio.

TABLE 192

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 4-L-8, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.5$ ,  $S=3.0$ ,  $U_c=-4.0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.4928	0.0011	5000	1000	1.12 E-6
0.5004	0.0076	25000	20000	3.78 E-7
0.5074	0.0070	45000	20000	3.50 E-7
0.5135	0.0062	65000	20000	3.08 E-7
0.5242	0.0106	85000	20000	5.32 E-7
0.5398	0.0157	105000	20000	7.84 E-7
0.5494	0.0095	115000	10000	9.52 E-7
0.5578	0.0084	123000	8000	1.05 E-6
0.5667	0.0089	131000	8000	1.07 E-6
0.5757	0.0090	139000	8000	1.12 E-6
0.5835	0.0079	147000	8000	9.80 E-7
0.5930	0.0095	155000	8000	1.19 E-6
0.6026	0.0095	163000	8000	1.19 E-6
0.6115	0.0090	171000	8000	1.12 E-6
0.6210	0.0096	179000	8000	1.19 E-6
0.6300	0.0090	187000	8000	1.12 E-6
0.6390	0.0089	195000	8000	1.12 E-6
0.6476	0.0087	203000	8000	1.08 E-6
0.6560	0.0084	211000	8000	1.05 E-6
0.6670	0.0109	219000	8000	1.36 E-6
0.6765	0.0096	227000	8000	1.19 E-6
0.6854	0.0089	235000	8000	1.12 E-6
0.6961	0.0107	243000	8000	1.33 E-6
0.6992	0.0031	247000	4000	7.70 E-7
0.7039	0.0048	251000	4000	1.19 E-6
0.7081	0.0042	255000	4000	1.05 E-6
0.7140	0.0059	259000	4000	1.47 E-6
0.7179	0.0039	263000	4000	9.80 E-7
0.7230	0.0050	267000	4000	1.26 E-6



TABLE 192 (continued)

RUN NO. 2

0.7706	0.0014	312000	1000	1.40 E-6
0.7762	0.0056	332000	20000	2.80 E-7
0.7795	0.0034	352000	20000	1.68 E-7
0.7829	0.0034	372000	20000	1.68 E-7
0.7879	0.0050	392000	20000	2.52 E-7
0.7969	0.0090	412000	20000	4.48 E-7
0.8036	0.0067	422000	10000	6.72 E-7
0.8103	0.0067	430000	8000	8.40 E-7
0.8165	0.0062	438000	8000	7.70 E-7
0.8243	0.0078	446000	8000	9.80 E-7
0.8336	0.0092	454000	8000	1.16 E-6
0.8411	0.0076	462000	8000	9.45 E-7
0.8495	0.0084	470000	8000	1.05 E-6
0.8576	0.0081	478000	8000	1.01 E-6
0.8660	0.0084	486000	8000	1.05 E-6
0.8747	0.0087	494000	8000	1.09 E-6
0.8842	0.0093	502000	8000	1.19 E-6
0.8926	0.0084	510000	8000	1.05 E-6
0.9027	0.0101	518000	8000	1.26 E-6
0.9117	0.0090	526000	8000	1.12 E-6
0.9206	0.0090	534000	8000	1.12 E-6
0.9296	0.0090	542000	8000	1.12 E-6
0.9386	0.0090	550000	8000	1.12 E-6
0.9436	0.0050	554000	4000	1.26 E-6
0.9470	0.0034	558000	4000	8.40 E-7
0.9514	0.0045	562000	4000	1.12 E-6
0.9565	0.0050	566000	4000	1.26 E-6
0.9610	0.0045	570000	4000	1.12 E-6
0.9660	0.0050	574000	4000	1.26 E-6

TABLE 192 (continued)

RUN NO. 3

0.9671	0.0011	575000	1000	1.49 E-6
0.9710	0.0039	595000	20000	1.96 E-7
0.9733	0.0022	615000	20000	1.12 E-7
0.9755	0.0022	635000	20000	1.12 E-7
0.9783	0.0028	655000	20000	1.40 E-7
0.9822	0.0039	675000	20000	1.96 E-7
0.9850	0.0028	685000	10000	2.80 E-7
0.9873	0.0022	693000	8000	2.80 E-7
0.9909	0.0036	701000	8000	4.55 E-7
0.9946	0.0036	709000	8000	4.55 E-7
0.9996	0.0050	717000	8000	6.30 E-7
1.0046	0.0050	725000	8000	6.30 E-7
1.0102	0.0056	733000	8000	7.00 E-7
1.0158	0.0056	741000	8000	7.00 E-7
1.0220	0.0062	749000	8000	7.70 E-7
1.0282	0.0062	757000	8000	7.70 E-7
1.0354	0.0073	765000	8000	9.10 E-7
1.0444	0.0090	773000	8000	1.12 E-6
1.0534	0.0090	781000	8000	1.12 E-6
1.0606	0.0073	789000	8000	9.10 E-7
1.0690	0.0084	797000	8000	1.05 E-6
1.0758	0.0067	805000	8000	8.40 E-7
1.0833	0.0076	813000	8000	9.45 E-7
1.0875	0.0042	817000	4000	1.05 E-6
1.0909	0.0034	821000	4000	8.40 E-7
1.0937	0.0028	825000	4000	7.00 E-7
1.0970	0.0034	829000	4000	8.40 E-7
1.1007	0.0036	833000	4000	9.10 E-7
1.1040	0.0034	837000	4000	8.40 E-7

TABLE 192 (continued)

## AVERAGE VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	1.34 E-6	0.0006	500
2	2.85 E-7	0.0041	11000
3	2.10 E-7	0.0090	31000
4	1.96 E-7	0.0131	51000
5	3.08 E-7	0.0181	71000
6	4.76 E-7	0.0259	91000
7	6.35 E-7	0.0339	106000
8	7.23 E-7	0.0399	115000
9	7.65 E-7	0.0459	123000
10	8.52 E-7	0.0524	131000
11	9.23 E-7	0.0595	139000
12	9.22 E-7	0.0669	147000
13	9.80 E-7	0.0745	155000
14	9.43 E-7	0.0822	163000
15	1.00 E-6	0.0900	171000
16	9.93 E-7	0.0980	179000
17	1.07 E-6	0.1063	187000
18	1.08 E-6	0.1149	195000
19	1.14 E-6	0.1239	203000
20	1.13 E-6	0.1330	211000
21	1.12 E-6	0.1420	219000
22	1.03 E-6	0.1506	227000
23	1.13 E-6	0.1593	235000
24	1.03 E-6	0.1659	241000
25	9.57 E-7	0.1698	245000
26	9.57 E-7	0.1737	249000
27	1.19 E-6	0.1780	253000
28	1.00 E-6	0.1824	257000
29	1.12 E-6	0.1866	261000

TABLE 192 (continued)

## AVERAGE VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0012	1000
2	0.0069	21000
3	0.0111	41000
4	0.0150	61000
5	0.0212	81000
6	0.0307	101000
7	0.0370	111000
8	0.0428	119000
9	0.0490	127000
10	0.0558	135000
11	0.0632	143000
12	0.0706	151000
13	0.0784	159000
14	0.0860	167000
15	0.0940	175000
16	0.1020	183000
17	0.1106	191000
18	0.1193	199000
19	0.1284	207000
20	0.1375	215000
21	0.1465	223000
22	0.1547	231000
23	0.1638	239000
24	0.1679	243000
25	0.1718	247000
26	0.1756	251000
27	0.1804	255000
28	0.1844	259000
29	0.1888	263000

TABLE 193

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 3-I-5, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.5$ ,  $U_c=-4.27$ ,  $S=3.2$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.4174	0.0014	8000	1000	1.40 E-6
1.4246	0.0073	58000	50000	1.46 E-7
1.4274	0.0028	108000	50000	5.60 E-8
1.4288	0.0014	158000	50000	2.80 E-8
1.4330	0.0042	208000	50000	8.40 E-8
1.4392	0.0062	258000	50000	1.23 E-7
1.4493	0.0101	308000	50000	2.02 E-7
1.4630	0.0137	358000	50000	2.74 E-7
1.4664	0.0034	368000	10000	3.36 E-7
1.4703	0.0039	378000	10000	3.92 E-7

Test performed to zero-in on overload shut-off ratio. Test terminated prior to reaching  $(da/dN)_c$ .

TABLE 194

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 3-L-5, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.5$ ,  $U_c = -4.4$ ,  $S=3.3$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.6979	0.0011	4000	1000	1.10 E-6
1.7002	0.0022	54000	50000	4.48 E-8
1.7013	0.0011	104000	50000	2.24 E-8
1.7024	0.0011	154000	50000	2.24 E-8
1.7024	0.0000	204000	50000	0.00 E+0
1.7024	0.0000	254000	50000	0.00 E+0
1.7024	0.0000	304000	50000	0.00 E+0
1.7024	0.0000	354000	50000	0.00 E+0
1.7024	0.0000	404000	50000	0.00 E+0
1.7035	0.0011	454000	50000	2.24 E-8
1.7035	0.0000	504000	50000	0.00 E+0
1.7035	0.0000	554000	50000	0.00 E+0
1.7046	0.0011	604000	50000	2.24 E-8
1.7046	0.0000	654000	50000	0.00 E+0
1.7046	0.0000	704000	50000	0.00 E+0
1.7046	0.0000	754000	50000	0.00 E+0
1.7114	0.0067	804000	50000	1.34 E-7
1.7270	0.0157	854000	50000	3.14 E-7
1.7674	0.0403	904000	50000	8.06 E-7

Test performed to zero-in on overload shut-off ratio. Test  
 terminated prior to reaching  $(da/dN)_c$ . Data for one crack tip.

TABLE 195

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 3-L-5, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.5$ ,  $U_0=-4.67$ ,  $S=3.5$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.1164	0.0014	9000	1000	1.40 E-6
1.1225	0.0062	59000	50000	1.23 E-7
1.1245	0.0020	109000	50000	3.92 E-8
1.1253	0.0008	159000	50000	1.68 E-8
1.1267	0.0014	209000	50000	2.80 E-8
1.1276	0.0008	259000	50000	1.68 E-8
1.1281	0.0006	309000	50000	1.12 E-8
1.1287	0.0006	359000	50000	1.12 E-8
1.1287	0.0000	409000	50000	0.00 E+0
1.1287	0.0000	459000	50000	0.00 E+0
1.1292	0.0006	509000	50000	1.12 E-8
1.1295	0.0003	559000	50000	5.60 E-9
1.1301	0.0006	609000	50000	1.12 E-8
1.1304	0.0003	659000	50000	5.60 E-9
1.1304	0.0000	709000	50000	0.00 E+0
1.1304	0.0000	759000	50000	0.00 E+0
1.1304	0.0000	809000	50000	0.00 E+0
1.1304	0.0000	859000	50000	0.00 E+0
1.1304	0.0000	909000	50000	0.00 E+0
1.1304	0.0000	959000	50000	0.00 E+0
1.1304	0.0000	1009000	50000	0.00 E+0

$S=3.5$  considered to be within 0.1 of overload shut-off ratio.

Data Tabulations for Tension-Tension Load Class  
With Hold Time in Tension



TABLE 196

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 6-L-14, TENSION-TENSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.1$ ,  $S=2.0$ ,  $U=20$ ,  $t@K_1=0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.9332	0.0039	2000	1000	3.92 E-6
0.9346	0.0014	4000	2000	7.00 E-7
0.9363	0.0017	6000	2000	8.40 E-7
0.9394	0.0031	8000	2000	1.54 E-6
0.9447	0.0053	10000	2000	2.66 E-6
0.9498	0.0050	12000	2000	2.52 E-6
0.9576	0.0078	14000	2000	3.92 E-6
0.9652	0.0076	16000	2000	3.78 E-6
0.9766	0.0115	18000	2000	5.74 E-6
0.9862	0.0095	20000	2000	4.75 E-6
0.9962	0.0101	22000	2000	5.04 E-6
1.0049	0.0087	24000	2000	4.34 E-6
1.0133	0.0084	26000	2000	4.20 E-6
1.0226	0.0092	28000	2000	4.62 E-6
1.0326	0.0101	30000	2000	5.04 E-6

TABLE 196 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	3.92 E-6	0.0020	500
2	7.00 E-7	0.0046	2000
3	8.40 E-7	0.0062	4000
4	1.54 E-6	0.0085	6000
5	2.66 E-6	0.0127	8000
6	2.52 E-6	0.0179	10000
7	3.92 E-6	0.0244	12000
8	3.78 E-6	0.0321	14000
9	5.74 E-6	0.0416	16000
10	4.76 E-6	0.0521	18000
11	5.04 E-6	0.0619	20000
12	4.34 E-6	0.0713	22000
13	4.20 E-6	0.0798	24000
14	4.62 E-6	0.0886	26000
15	5.04 E-6	0.0983	28000

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0039	1000
2	0.0053	3000
3	0.0070	5000
4	0.0101	7000
5	0.0154	9000
6	0.0204	11000
7	0.0283	13000
8	0.0358	15000
9	0.0473	17000
10	0.0568	19000
11	0.0669	21000
12	0.0756	23000
13	0.0840	25000
14	0.0932	27000
15	0.1033	29000

TABLE 197

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM

TEMPERATURE DESICCATED AIR

SPECIMEN NO. 6-L-14, TENSION-TENSION

F=12Hz,  $K_2=10$ , R=0.1, S=2.0, U=20,  $t@K_1=5$  Sec.

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.0508	0.0042	4000	1000	4.20 E-6
1.0520	0.0011	6000	2000	5.60 E-7
1.0534	0.0014	8000	2000	7.00 E-7
1.0556	0.0022	10000	2000	1.12 E-6
1.0578	0.0022	12000	2000	1.12 E-6
1.0606	0.0028	14000	2000	1.40 E-6
1.0671	0.0064	16000	2000	3.22 E-6
1.0752	0.0081	18000	2000	4.06 E-6
1.0842	0.0090	20000	2000	4.48 E-6
1.0926	0.0034	22000	2000	4.20 E-6
1.0998	0.0073	24000	2000	3.64 E-6
1.1096	0.0098	26000	2000	4.90 E-6
1.1189	0.0092	28000	2000	4.62 E-6
1.1281	0.0092	30000	2000	4.62 E-6
1.1371	0.0090	32000	2000	4.48 E-6
1.1460	0.0090	34000	2000	4.48 E-6

TABLE 197 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	4.20 E-6	0.0021	500
2	5.60 E-7	0.0048	2000
3	7.00 E-7	0.0060	4000
4	1.12 E-6	0.0078	6000
5	1.12 E-6	0.0101	8000
6	1.40 E-6	0.0126	10000
7	3.22 E-6	0.0172	12000
8	4.06 E-6	0.0245	14000
9	4.48 E-6	0.0330	16000
10	4.20 E-6	0.0417	18000
11	3.64 E-6	0.0496	20000
12	4.90 E-6	0.0581	22000
13	4.62 E-6	0.0676	24000
14	4.62 E-6	0.0769	26000
15	4.48 E-6	0.0860	28000
16	4.48 E-6	0.0949	30000

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0042	1000
2	0.0053	3000
3	0.0067	5000
4	0.0090	7000
5	0.0112	9000
6	0.0140	11000
7	0.0204	13000
8	0.0286	15000
9	0.0375	17000
10	0.0459	19000
11	0.0532	21000
12	0.0630	23000
13	0.0722	25000
14	0.0815	27000
15	0.0904	29000
16	0.0994	31000

TABLE 198

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 6-I-14, TENSION-TENSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.1$ ,  $S=2.0$ ,  $U=20$ ,  $t@K_1=15\text{ Min.}$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.4788	0.0053	4000	1000	5.32 E-6
0.4813	0.0025	6000	2000	1.26 E-6
0.4827	0.0014	8000	2000	7.00 E-7
0.4836	0.0008	10000	2000	4.20 E-7
0.4844	0.0008	12000	2000	4.20 E-7
0.4858	0.0014	14000	2000	7.00 E-7
0.4878	0.0020	16000	2000	9.80 E-7
0.4897	0.0020	18000	2000	9.80 E-7
0.4950	0.0053	20000	2000	2.66 E-6
0.5032	0.0081	22000	2000	4.06 E-6
0.5110	0.0078	24000	2000	3.92 E-6
0.5205	0.0095	26000	2000	4.76 E-6
0.5312	0.0106	28000	2000	5.32 E-6
0.5426	0.0115	30000	2000	5.74 E-6
0.5527	0.0101	32000	2000	5.04 E-6
0.5628	0.0101	34000	2000	5.04 E-6
0.5723	0.0095	36000	2000	4.76 E-6
0.5824	0.0101	38000	2000	5.04 E-6

TABLE 198 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	5.32 E-6	0.0027	500
2	1.26 E-6	0.0066	2000
3	7.00 E-7	0.0085	4000
4	4.20 E-7	0.0097	6000
5	4.20 E-7	0.0105	8000
6	7.00 E-7	0.0116	10000
7	9.80 E-7	0.0133	12000
8	9.80 E-7	0.0153	14000
9	2.66 E-6	0.0189	16000
10	4.06 E-6	0.0256	18000
11	3.92 E-6	0.0336	20000
12	4.76 E-6	0.0423	22000
13	5.32 E-6	0.0524	24000
14	5.74 E-6	0.0634	26000
15	5.04 E-6	0.0742	28000
16	5.04 E-6	0.0843	30000
17	4.76 E-6	0.0941	32000
18	5.04 E-6	0.1039	34000

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0053	1000
2	0.0078	3000
3	0.0092	5000
4	0.0101	7000
5	0.0109	9000
6	0.0123	11000
7	0.0143	13000
8	0.0162	15000
9	0.0216	17000
10	0.0297	19000
11	0.0375	21000
12	0.0470	23000
13	0.0577	25000
14	0.0692	27000
15	0.0792	29000
16	0.0893	31000
17	0.0988	33000
18	0.1089	35000

TABLE 199

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
TEMPERATURE DESICCATED AIR

SPECIMEN NO. 6-L-14, TENSION-TENSION  
F=12Hz,  $K_2=10$ , R=0.1, S=2.0, U=20,  $t@K_1=60$  Min.

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.5936	0.0045	3000	1000	4.48 E-6
0.5953	0.0017	5000	2000	8.40 E-7
0.5961	0.0008	7000	2000	4.20 E-7
0.5975	0.0014	9000	2000	7.00 E-7
0.5981	0.0006	11000	2000	2.80 E-7
0.5989	0.0008	13000	2000	4.20 E-7
0.6003	0.0014	15000	2000	7.00 E-7
0.6023	0.0020	17000	2000	9.80 E-7
0.6054	0.0031	19000	2000	1.54 E-6
0.6107	0.0053	21000	2000	2.66 E-6
0.6191	0.0084	23000	2000	4.20 E-6
0.6289	0.0098	25000	2000	4.90 E-6
0.6384	0.0095	27000	2000	4.76 E-6
0.6482	0.0098	29000	2000	4.90 E-6
0.6580	0.0098	31000	2000	4.90 E-6
0.6686	0.0106	33000	2000	5.32 E-6
0.6784	0.0098	35000	2000	4.90 E-6
0.6880	0.0095	37000	2000	4.76 E-6

TABLE 199 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	4.48 E-6	0.0022	500
2	8.40 E-7	0.0053	2000
3	4.20 E-7	0.0066	4000
4	7.00 E-7	0.0077	6000
5	2.80 E-7	0.0087	8000
6	4.20 E-7	0.0094	10000
7	7.00 E-7	0.0105	12000
8	9.80 E-7	0.0122	14000
9	1.54 E-6	0.0147	16000
10	2.66 E-6	0.0189	18000
11	4.20 E-6	0.0258	20000
12	4.90 E-6	0.0349	22000
13	4.76 E-6	0.0445	24000
14	4.90 E-6	0.0542	26000
15	4.90 E-6	0.0640	28000
16	5.32 E-6	0.0742	30000
17	4.90 E-6	0.0844	32000
18	4.76 E-6	0.0941	34000

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0045	1000
2	0.0062	3000
3	0.0070	5000
4	0.0084	7000
5	0.0090	9000
6	0.0098	11000
7	0.0112	13000
8	0.0132	15000
9	0.0162	17000
10	0.0216	19000
11	0.0300	21000
12	0.0398	23000
13	0.0493	25000
14	0.0591	27000
15	0.0689	29000
16	0.0795	31000
17	0.0893	33000
18	0.0988	35000



TABLE 200

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 5-I-11, TENSION-TENSION  
 F=12Hz,  $K_2=10$ , R=0.1, S=2.0, U=20,  $t@K_1=24$  Hr.

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.8812	0.0031	9000	1000	3.08 E-6
0.8834	0.0022	11000	2000	1.12 E-6
0.8842	0.0008	13000	2000	4.20 E-7
0.8851	0.0008	15000	2000	4.20 E-7
0.8854	0.0003	17000	2000	1.40 E-7
0.8862	0.0008	19000	2000	4.20 E-7
0.8868	0.0006	21000	2000	2.80 E-7
0.8873	0.0006	23000	2000	2.80 E-7
0.8882	0.0008	25000	2000	4.20 E-7
0.8898	0.0017	27000	2000	8.40 E-7
0.8910	0.0011	29000	2000	5.60 E-7
0.8943	0.0034	31000	2000	1.68 E-6
0.9016	0.0073	33000	2000	3.64 E-6
0.9100	0.0084	35000	2000	4.20 E-6
0.9212	0.0112	37000	2000	5.60 E-6
0.9341	0.0129	39000	2000	6.44 E-6
0.9458	0.0118	41000	2000	5.88 E-6
0.9559	0.0101	43000	2000	5.04 E-6
0.9666	0.0106	45000	2000	5.32 E-6

TABLE 200 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	3.08 E-6	0.0015	500
2	1.12 E-6	0.0042	2000
3	4.20 E-7	0.0057	4000
4	4.20 E-7	0.0066	6000
5	1.40 E-7	0.0071	8000
6	4.20 E-7	0.0077	10000
7	2.80 E-7	0.0084	12000
8	2.80 E-7	0.0090	14000
9	4.20 E-7	0.0097	16000
10	8.40 E-7	0.0109	18000
11	5.60 E-7	0.0123	20000
12	1.68 E-6	0.0146	22000
13	3.64 E-6	0.0199	24000
14	4.20 E-6	0.0277	26000
15	5.60 E-6	0.0375	28000
16	6.44 E-6	0.0496	30000
17	5.88 E-6	0.0619	32000
18	5.04 E-6	0.0728	34000
19	5.32 E-6	0.0832	36000

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0031	1000
2	0.0053	3000
3	0.0062	5000
4	0.0070	7000
5	0.0073	9000
6	0.0081	11000
7	0.0087	13000
8	0.0092	15000
9	0.0101	17000
10	0.0118	19000
11	0.0129	21000
12	0.0162	23000
13	0.0235	25000
14	0.0319	27000
15	0.0431	29000
16	0.0560	31000
17	0.0678	33000
18	0.0778	35000
19	0.0885	37000

TABLE 201

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
TEMPERATURE DESICCATED AIR

SPECIMEN NO. 6-L-14, TENSION-TENSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.1$ ,  $S=2.5$ ,  $U=25$ ,  $t@K_1=0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.4591	0.0034	6000	1000	3.36 E-6
1.4619	0.0028	16000	10000	2.80 E-7
1.4638	0.0020	26000	10000	1.96 E-7
1.4686	0.0048	36000	10000	4.76 E-7
1.4778	0.0092	41000	5000	1.85 E-6
1.4823	0.0045	43000	2000	2.24 E-6
1.4890	0.0067	45000	2000	3.36 E-6
1.4944	0.0053	47000	2000	2.66 E-6
1.5022	0.0078	49000	2000	3.92 E-6
1.5084	0.0062	51000	2000	3.08 E-6
1.5176	0.0092	53000	2000	4.62 E-6
1.5254	0.0078	55000	2000	3.92 E-6
1.5341	0.0087	57000	2000	4.34 E-6
1.5417	0.0076	59000	2000	3.78 E-6
1.5495	0.0078	61000	2000	3.92 E-6

TABLE 201 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	3.36 E-6	0.0017	500
2	2.80 E-7	0.0048	6000
3	1.96 E-7	0.0071	16000
4	4.76 E-7	0.0105	26000
5	1.85 E-6	0.0175	33500
6	2.24 E-6	0.0244	37000
7	3.36 E-6	0.0300	39000
8	2.66 E-6	0.0360	41000
9	3.92 E-6	0.0426	43000
10	3.08 E-6	0.0496	45000
11	4.62 E-6	0.0573	47000
12	3.92 E-6	0.0658	49000
13	4.34 E-6	0.0741	51000
14	3.78 E-6	0.0822	53000
15	3.92 E-6	0.0899	55000

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0034	1000
2	0.0062	11000
3	0.0081	21000
4	0.0129	31000
5	0.0221	36000
6	0.0266	38000
7	0.0333	40000
8	0.0386	42000
9	0.0465	44000
10	0.0526	46000
11	0.0619	48000
12	0.0697	50000
13	0.0784	52000
14	0.0860	54000
15	0.0938	56000

TABLE 202

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 6-L-14, TENSION-TENSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.1$ ,  $S=2.5$ ,  $U=25$ ,  $t@K_1=15\text{ Min.}$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.1673	0.0042	5500	1000	4.20 E-6
1.1704	0.0031	15500	10000	3.08 E-7
1.1718	0.0014	25500	10000	1.40 E-7
1.1729	0.0011	35500	10000	1.12 E-7
1.1740	0.0011	45500	10000	1.12 E-7
1.1760	0.0020	55500	10000	1.96 E-7
1.1785	0.0025	60500	5000	5.04 E-7
1.1822	0.0036	65500	5000	7.28 E-7
1.1844	0.0022	67500	2000	1.12 E-6
1.1900	0.0056	69500	2000	2.80 E-6
1.1959	0.0059	71500	2000	2.94 E-6
1.2026	0.0067	73500	2000	3.36 E-6
1.2118	0.0092	75500	2000	4.62 E-6
1.2200	0.0081	77500	2000	4.06 E-6
1.2286	0.0087	79500	2000	4.34 E-6
1.2379	0.0092	81500	2000	4.62 E-6

TABLE 202 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	4.20 E-6	0.0021	500
2	3.08 E-7	0.0057	6000
3	1.40 E-7	0.0080	16000
4	1.12 E-7	0.0092	26000
5	1.12 E-7	0.0104	36000
6	1.96 E-7	0.0119	46000
7	5.04 E-7	0.0141	53500
8	7.28 E-7	0.0172	58500
9	1.12 E-6	0.0202	62000
10	2.80 E-6	0.0241	64000
11	2.94 E-6	0.0298	66000
12	3.36 E-6	0.0361	68000
13	4.62 E-6	0.0441	70000
14	4.06 E-6	0.0528	72000
15	4.34 E-6	0.0612	74000
16	4.62 E-6	0.0701	76000

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0042	1000
2	0.0073	11000
3	0.0087	21000
4	0.0098	31000
5	0.0109	41000
6	0.0129	51000
7	0.0154	56000
8	0.0190	61000
9	0.0213	63000
10	0.0269	65000
11	0.0328	67000
12	0.0395	69000
13	0.0487	71000
14	0.0568	73000
15	0.0655	75000
16	0.0748	77000

TABLE 203

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 6-L-14, TENSION-TENSION  
 F=12Hz,  $K_2=10$ , R=0.1, S=2.5, U=25,  $t@K_1=60$  Min.

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.2583	0.0045	2000	1000	4.48 E-6
1.2614	0.0031	12000	10000	3.08 E-7
1.2622	0.0008	22000	10000	8.40 E-8
1.2631	0.0008	32000	10000	8.40 E-8
1.2653	0.0022	42000	10000	2.24 E-7
1.2659	0.0006	52000	10000	5.60 E-8
1.2673	0.0014	62000	10000	1.40 E-7
1.2681	0.0008	72000	10000	8.40 E-8
1.2701	0.0020	82000	10000	1.96 E-7
1.2757	0.0056	87000	5000	1.12 E-6
1.2788	0.0031	89000	2000	1.54 E-6
1.2869	0.0081	91000	2000	4.06 E-6
1.2950	0.0081	93000	2000	4.06 E-6
1.3048	0.0098	95000	2000	4.90 E-6
1.3143	0.0095	97000	2000	4.76 E-6
1.3233	0.0090	99000	2000	4.48 E-6
1.3314	0.0081	101000	2000	4.06 E-6
1.3384	0.0070	103000	2000	3.50 E-6
1.3462	0.0078	105000	2000	3.92 E-6
1.3544	0.0081	107000	2000	4.06 E-6
1.3628	0.0084	109000	2000	4.20 E-6
1.3703	0.0076	111000	2000	3.78 E-6
1.3770	0.0067	113000	2000	3.36 E-6
1.3843	0.0073	115000	2000	3.64 E-6
1.3913	0.0070	117000	2000	3.50 E-6
1.3980	0.0067	119000	2000	3.36 E-6
1.4050	0.0070	121000	2000	3.50 E-6
1.4123	0.0073	123000	2000	3.64 E-6
1.4213	0.0090	125000	2000	4.48 E-6

TABLE 203 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	4.48 E-6	0.0022	500
2	3.08 E-7	0.0060	6000
3	8.40 E-8	0.0080	16000
4	8.40 E-8	0.0088	26000
5	2.24 E-7	0.0104	36000
6	5.60 E-8	0.0118	46000
7	1.40 E-7	0.0127	56000
8	8.40 E-8	0.0139	66000
9	1.96 E-7	0.0153	76000
10	1.12 E-6	0.0190	83500
11	1.54 E-6	0.0234	87000
12	4.06 E-6	0.0290	89000
13	4.06 E-6	0.0371	91000
14	4.90 E-6	0.0461	93000
15	4.76 E-6	0.0557	95000
16	4.48 E-6	0.0650	97000
17	4.06 E-6	0.0735	99000
18	3.50 E-6	0.0811	101000
19	3.92 E-6	0.0885	103000
20	4.06 E-6	0.0965	105000
21	4.20 E-6	0.1047	107000
22	3.78 E-6	0.1127	109000
23	3.36 E-6	0.1198	111000
24	3.64 E-6	0.1268	113000
25	3.50 E-6	0.1340	115000
26	3.36 E-6	0.1408	117000
27	3.50 E-6	0.1477	119000
28	3.64 E-6	0.1548	121000
29	4.48 E-6	0.1630	123000



TABLE 203 (continued)

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0045	1000
2	0.0076	11000
3	0.0084	21000
4	0.0092	31000
5	0.0115	41000
6	0.0120	51000
7	0.0134	61000
8	0.0143	71000
9	0.0162	81000
10	0.0218	86000
11	0.0249	88000
12	0.0330	90000
13	0.0412	92000
14	0.0510	94000
15	0.0605	96000
16	0.0694	98000
17	0.0776	100000
18	0.0846	102000
19	0.0924	104000
20	0.1005	106000
21	0.1089	108000
22	0.1165	110000
23	0.1232	112000
24	0.1305	114000
25	0.1375	116000
26	0.1442	118000
27	0.1512	120000
28	0.1585	122000
29	0.1674	124000

TABLE 204

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 6-L-14, TENSION-TENSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.1$ ,  $S=2.5$ ,  $U=25$ ,  $t@K_1=4\text{ Hr.}$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.6178	0.0050	5000	1000	5.00 E-6
1.6212	0.0034	15000	10000	3.36 E-7
1.6223	0.0011	25000	10000	1.12 E-7
1.6229	0.0006	35000	10000	5.60 E-8
1.6234	0.0006	45000	10000	5.60 E-8
1.6240	0.0006	55000	10000	5.60 E-8
1.6240	0.0000	65000	10000	0.00 E+0
1.6251	0.0011	75000	10000	1.12 E-7
1.6274	0.0022	85000	10000	2.24 E-7
1.6307	0.0034	95000	10000	3.36 E-7
1.6386	0.0078	100000	5000	1.57 E-6
1.6565	0.0179	105000	5000	3.58 E-6
1.6654	0.0090	107000	2000	4.48 E-6
1.6750	0.0095	109000	2000	4.76 E-6
1.6822	0.0073	111000	2000	3.64 E-6
1.6912	0.0090	113000	2000	4.48 E-6
1.6996	0.0084	115000	2000	4.20 E-6

TABLE 204 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	5.00 E-6	0.0025	500
2	3.36 E-7	0.0067	6000
3	1.12 E-7	0.0089	16000
4	5.60 E-8	0.0098	26000
5	5.60 E-8	0.0103	36000
6	5.60 E-8	0.0109	46000
7	0.00 E+0	0.0112	56000
8	1.12 E-7	0.0117	66000
9	2.24 E-7	0.0134	76000
10	3.36 E-7	0.0162	86000
11	1.57 E-6	0.0218	93500
12	3.58 E-6	0.0347	98500
13	4.48 E-6	0.0481	102000
14	4.76 E-6	0.0574	104000
15	3.64 E-6	0.0658	106000
16	4.40 E-6	0.0739	108000
17	4.20 E-6	0.0826	110000

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0050	1000
2	0.0084	11000
3	0.0095	21000
4	0.0100	31000
5	0.0106	41000
6	0.0112	51000
7	0.0112	61000
8	0.0123	71000
9	0.0145	81000
10	0.0179	91000
11	0.0257	96000
12	0.0436	101000
13	0.0526	103000
14	0.0621	105000
15	0.0694	107000
16	0.0784	109000
17	0.0868	111000

Data adjusted to reflect growth of one crack tip.

TABLE 205

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 2-L-6, TENSION-TENSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.1$ ,  $S=2.5$ ,  $U=25$ ,  $t@K_1=24$  Hr.

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.6303	0.0073	5000	1000	7.28 E-6
0.6334	0.0031	15000	10000	3.08 E-7
0.6345	0.0011	25000	10000	1.12 E-7
0.6350	0.0006	35000	10000	5.60 E-8
0.6350	0.0000	45000	10000	0.00 E+0
0.6353	0.0003	55000	10000	2.80 E-8
0.6364	0.0011	65000	10000	1.12 E-7
0.6364	0.0000	75000	10000	0.00 E+0
0.6364	0.0000	85000	10000	0.00 E+0
0.6367	0.0003	95000	10000	2.80 E-8
0.6373	0.0006	105000	10000	5.60 E-8
0.6390	0.0017	115000	10000	1.68 E-7
0.6406	0.0017	120000	5000	3.36 E-7
0.6415	0.0008	122000	2000	4.20 E-7
0.6423	0.0008	124000	2000	4.20 E-7
0.6440	0.0017	126000	2000	8.40 E-7
0.6471	0.0031	128000	2000	1.54 E-6
0.6507	0.0036	130000	2000	1.82 E-6
0.6600	0.0092	132000	2000	4.62 E-6
0.6675	0.0076	134000	2000	3.78 E-6
0.6748	0.0073	136000	2000	3.64 E-6
0.6838	0.0090	138000	2000	4.48 E-6
0.6933	0.0095	140000	2000	4.76 E-6
0.7062	0.0129	142000	2000	6.44 E-6
0.7168	0.0106	144000	2000	5.32 E-6
0.7269	0.0101	146000	2000	5.04 E-6
0.7370	0.0101	148000	2000	5.04 E-6
0.7470	0.0101	150000	2000	5.04 E-6
0.7577	0.0106	152000	2000	5.32 E-6

TABLE 205 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	7.28 E-6	0.0036	500
2	3.08 E-7	0.0088	6000
3	1.12 E-7	0.0109	16000
4	5.60 E-8	0.0118	26000
5	0.00 E+0	0.0120	36000
6	2.80 E-8	0.0122	46000
7	1.12 E-7	0.0129	56000
8	0.00 E+0	0.0134	66000
9	0.00 E+0	0.0134	76000
10	2.80 E-8	0.0136	86000
11	5.60 E-8	0.0140	96000
12	1.68 E-7	0.0151	106000
13	3.36 E-7	0.0168	113500
14	4.20 E-7	0.0181	117000
15	4.20 E-7	0.0189	119000
16	8.40 E-7	0.0202	121000
17	1.54 E-6	0.0225	123000
18	1.82 E-6	0.0259	125000
19	4.62 E-6	0.0323	127000
20	3.78 E-6	0.0407	129000
21	3.64 E-6	0.0482	131000
22	4.48 E-6	0.0563	133000
23	4.76 E-6	0.0655	135000
24	6.44 E-6	0.0767	137000
25	5.32 E-6	0.0885	139000
26	5.04 E-6	0.0988	141000
27	5.04 E-6	0.1089	143000
28	5.04 E-6	0.1190	145000
29	5.32 E-6	0.1294	147000

TABLE 205 (continued)

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0073	1000
2	0.0104	11000
3	0.0115	21000
4	0.0120	31000
5	0.0120	41000
6	0.0123	51000
7	0.0134	61000
8	0.0134	71000
9	0.0134	81000
10	0.0137	91000
11	0.0143	101000
12	0.0160	111000
13	0.0176	116000
14	0.0185	118000
15	0.0193	120000
16	0.0210	122000
17	0.0241	124000
18	0.0277	126000
19	0.0370	128000
20	0.0445	130000
21	0.0518	132000
22	0.0608	134000
23	0.0703	136000
24	0.0832	138000
25	0.0938	140000
26	0.1039	142000
27	0.1140	144000
28	0.1240	146000
29	0.1347	148000

TABLE 206

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 2-L-4, TENSION-TENSION  
 $F=12\text{Hz}$ ,  $K_2=7.78$ ,  $R=.128$ ,  $S=2.57$ ,  $U=20$ ,  $t@K_1=0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.3006	0.0025	6000	1000	2.52 E-6
1.3014	0.0008	8000	2000	4.20 E-7
1.3014	0.0000	10000	2000	0.00 E+0
1.3014	0.0000	12000	2000	0.00 E+0
1.3014	0.0000	18000	6000	0.00 E+0
1.3020	0.0006	24000	6000	9.33 E-8
1.3020	0.0000	30000	6000	0.00 E+0
1.3026	0.0006	36000	6000	9.33 E-8
1.3026	0.0000	42000	6000	0.00 E+0
1.3031	0.0006	48000	6000	9.33 E-8
1.3037	0.0006	54000	6000	9.33 E-8
1.3051	0.0014	60000	6000	2.33 E-7
1.3062	0.0011	62000	2000	5.60 E-7
1.3082	0.0020	64000	2000	9.80 E-7
1.3101	0.0020	66000	2000	9.80 E-7
1.3112	0.0011	68000	2000	5.60 E-7
1.3143	0.0031	70000	2000	1.54 E-6
1.3182	0.0039	72000	2000	1.96 E-6
1.3208	0.0025	74000	2000	1.26 E-6
1.3233	0.0025	76000	2000	1.26 E-6
1.3278	0.0045	78000	2000	2.24 E-6
1.3325	0.0048	80000	2000	2.38 E-6
1.3376	0.0050	82000	2000	2.52 E-6
1.3418	0.0042	84000	2000	2.10 E-6
1.3465	0.0048	86000	2000	2.38 E-6
1.3516	0.0050	88000	2000	2.52 E-6
1.3569	0.0053	90000	2000	2.66 E-6
1.3614	0.0045	92000	2000	2.24 E-6
1.3658	0.0045	94000	2000	2.24 E-6

TABLE 206 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	2.52 E-6	0.0013	500
2	4.20 E-7	0.0029	2000
3	0.00 E+0	0.0034	4000
4	0.00 E+0	0.0034	6000
5	0.00 E+0	0.0034	10000
6	9.33 E-8	0.0036	16000
7	0.00 E+0	0.0039	22000
8	9.33 E-8	0.0042	28000
9	0.00 E+0	0.0045	34000
10	9.33 E-8	0.0048	40000
11	9.33 E-8	0.0053	46000
12	2.33 E-7	0.0063	52000
13	5.60 E-7	0.0076	56000
14	9.80 E-7	0.0091	58000
15	9.80 E-7	0.0111	60000
16	5.60 E-7	0.0126	62000
17	1.54 E-6	0.0147	64000
18	1.96 E-6	0.0182	66000
19	1.26 E-6	0.0214	68000
20	1.26 E-6	0.0239	70000
21	2.24 E-6	0.0274	72000
22	2.38 E-6	0.0321	74000
23	2.52 E-6	0.0370	76000
24	2.10 E-6	0.0416	78000
25	2.38 E-6	0.0461	80000
26	2.52 E-6	0.0510	82000
27	2.66 E-6	0.0561	84000
28	2.24 E-6	0.0610	86000
29	2.24 E-6	0.0655	88000



TABLE 206 (continued)

## VALUES AT END OF READING INCREMENT

INCR. #	TOT CRACK	TOT CYCLES
1	0.0025	1000
2	0.0034	3000
3	0.0034	5000
4	0.0034	7000
5	0.0034	13000
6	0.0039	19000
7	0.0039	25000
8	0.0045	31000
9	0.0045	37000
10	0.0050	43000
11	0.0056	49000
12	0.0070	55000
13	0.0081	57000
14	0.0101	59000
15	0.0120	61000
16	0.0132	63000
17	0.0162	65000
18	0.0202	67000
19	0.0227	69000
20	0.0252	71000
21	0.0297	73000
22	0.0344	75000
23	0.0395	77000
24	0.0437	79000
25	0.0484	81000
26	0.0535	83000
27	0.0588	85000
28	0.0633	87000
29	0.0678	89000

TABLE 207

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
TEMPERATURE DESICCATED AIR

SPECIMEN NO. 2-L-4, TENSION-TENSION

F=12Hz,  $K_2=7.78$ , R=.128, S=2.57, U=20,  $t@K_1=15$  Min.

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.6542	0.0039	4000	1000	3.92 E-6
1.6542	0.0000	8000	4000	0.00 E+0
1.6554	0.0011	32000	24000	4.67 E-8
1.6554	0.0000	56000	24000	0.00 E+0
1.6565	0.0011	68000	12000	9.33 E-8
1.6570	0.0006	80000	12000	4.67 E-8
1.6587	0.0017	92000	12000	1.40 E-7
1.6654	0.0067	104000	12000	5.60 E-7
1.6694	0.0039	106000	2000	1.96 E-6
1.6722	0.0028	108000	2000	1.40 E-6
1.6800	0.0078	110000	2000	3.92 E-6
1.6856	0.0056	112000	2000	2.80 E-6
1.6923	0.0067	114000	2000	3.36 E-6
1.6979	0.0056	116000	2000	2.80 E-6
1.7013	0.0034	118000	2000	1.68 E-6
1.7052	0.0039	120000	2000	1.96 E-6
1.7102	0.0050	122000	2000	2.52 E-6
1.7147	0.0045	124000	2000	2.24 E-6
1.7181	0.0034	126000	2000	1.68 E-6
1.7242	0.0062	128000	2000	3.08 E-6
1.7298	0.0056	130000	2000	2.80 E-6
1.7354	0.0056	132000	2000	2.80 E-6
1.7399	0.0045	134000	2000	2.24 E-6
1.7444	0.0045	136000	2000	2.24 E-6
1.7494	0.0050	138000	2000	2.52 E-6
1.7534	0.0039	140000	2000	1.96 E-6
1.7567	0.0034	142000	2000	1.68 E-6
1.7606	0.0039	144000	2000	1.96 E-6
1.7662	0.0056	146000	2000	2.80 E-6

TABLE 207 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	3.92 E-6	0.0020	500
2	0.00 E+0	0.0039	3000
3	4.67 E-8	0.0045	17000
4	0.00 E+0	0.0050	41000
5	9.33 E-8	0.0056	59000
6	4.67 E-8	0.0064	71000
7	1.40 E-7	0.0076	83000
8	5.60 E-7	0.0118	95000
9	1.96 E-6	0.0171	102000
10	1.40 E-6	0.0204	104000
11	3.92 E-6	0.0258	106000
12	2.80 E-6	0.0325	108000
13	3.36 E-6	0.0386	110000
14	2.80 E-6	0.0448	112000
15	1.68 E-6	0.0493	114000
16	1.96 E-6	0.0529	116000
17	2.52 E-6	0.0574	118000
18	2.24 E-6	0.0622	120000
19	1.68 E-6	0.0661	122000
20	3.08 E-6	0.0708	124000
21	2.80 E-6	0.0767	126000
22	2.80 E-6	0.0823	128000
23	2.24 E-6	0.0874	130000
24	2.24 E-6	0.0918	132000
25	2.52 E-6	0.0966	134000
26	1.96 E-6	0.1011	136000
27	1.68 E-6	0.1047	138000
28	1.96 E-6	0.1084	140000
29	2.80 E-6	0.1131	142000

TABLE 207 (continued)

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0039	1000
2	0.0039	5000
3	0.0050	29000
4	0.0050	53000
5	0.0062	65000
6	0.0067	77000
7	0.0084	89000
8	0.0151	101000
9	0.0190	103000
10	0.0218	105000
11	0.0297	107000
12	0.0353	109000
13	0.0420	111000
14	0.0476	113000
15	0.0510	115000
16	0.0549	117000
17	0.0599	119000
18	0.0644	121000
19	0.0678	123000
20	0.0739	125000
21	0.0795	127000
22	0.0851	129000
23	0.0896	131000
24	0.0941	133000
25	0.0991	135000
26	0.1030	137000
27	0.1064	139000
28	0.1103	141000
29	0.1159	143000

Data adjusted to reflect growth of one crack tip.

TABLE 208

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 2-L-4, TENSION-TENSION  
 $F=12\text{Hz}$ ,  $K_2=7.78$ ,  $R=.128$ ,  $S=2.57$ ,  $U=20$ ,  $t@K_1=60\text{ Min.}$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.4258	0.0011	15500	1000	1.10 E-6
1.4280	0.0022	17500	2000	1.12 E-6
1.4286	0.0006	21500	4000	1.40 E-7
1.4291	0.0006	33500	12000	4.67 E-8
1.4297	0.0006	45500	12000	4.67 E-8
1.4302	0.0006	57500	12000	4.67 E-8
1.4308	0.0006	69500	12000	4.67 E-8
1.4308	0.0000	81500	12000	0.00 E+0
1.4308	0.0000	93500	12000	0.00 E+0
1.4325	0.0017	105500	12000	1.40 E-7
1.4358	0.0034	117500	12000	2.80 E-7
1.4493	0.0134	123500	6000	2.24 E-6
1.4689	0.0196	129500	6000	3.27 E-6
1.4750	0.0062	131500	2000	3.08 E-6
1.4801	0.0050	133500	2000	2.52 E-6
1.4840	0.0039	135500	2000	1.96 E-6
1.4896	0.0056	137500	2000	2.80 E-6
1.4974	0.0078	139500	2000	3.92 E-6
1.5008	0.0034	141500	2000	1.68 E-6
1.5053	0.0045	143500	2000	2.24 E-6
1.5098	0.0045	145500	2000	2.24 E-6
1.5142	0.0045	147500	2000	2.24 E-6

TABLE 208 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	1.10 E-6	0.0006	500
2	1.12 E-6	0.0022	2000
3	1.40 E-7	0.0036	5000
4	4.67 E-8	0.0042	13000
5	4.67 E-8	0.0047	25000
6	4.67 E-8	0.0053	37000
7	4.67 E-8	0.0059	49000
8	0.00 E+0	0.0061	61000
9	0.00 E+0	0.0061	73000
10	1.40 E-7	0.0070	85000
11	2.80 E-7	0.0095	97000
12	2.24 E-6	0.0179	106000
13	3.27 E-6	0.0344	112000
14	3.08 E-6	0.0473	116000
15	2.52 E-6	0.0529	118000
16	1.96 E-6	0.0574	120000
17	2.80 E-6	0.0621	122000
18	3.92 E-6	0.0689	124000
19	1.68 E-6	0.0745	126000
20	2.24 E-6	0.0784	128000
21	2.24 E-6	0.0829	130000
22	2.24 E-6	0.0873	132000

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0011	1000
2	0.0033	3000
3	0.0039	7000
4	0.0045	19000
5	0.0050	31000
6	0.0056	43000
7	0.0061	55000
8	0.0061	67000
9	0.0061	79000
10	0.0078	91000
11	0.0112	103000
12	0.0246	109000
13	0.0442	115000
14	0.0504	117000
15	0.0554	119000
16	0.0593	121000
17	0.0649	123000
18	0.0728	125000
19	0.0761	127000
20	0.0806	129000
21	0.0851	131000
22	0.0896	133000

Data adjusted to reflect growth of one crack tip.

TABLE 209

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 2-I-4, TENSION-TENSION  
 $F=12\text{Hz}$ ,  $K_2=7.78$ ,  $R=.128$ ,  $S=2.57$ ,  $U=20$ ,  $t@K_1=4\text{ Hr.}$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.1553	0.0011	6000	1000	1.10 E-6
1.1558	0.0006	8000	2000	2.80 E-7
1.1570	0.0011	20000	12000	9.33 E-8
1.1575	0.0006	32000	12000	4.67 E-8
1.1575	0.0000	44000	12000	0.00 E+0
1.1575	0.0000	56000	12000	0.00 E+0
1.1575	0.0000	68000	12000	0.00 E+0
1.1575	0.0000	80000	12000	0.00 E+0
1.1575	0.0000	92000	12000	0.00 E+0
1.1581	0.0006	104000	12000	4.67 E-8
1.1581	0.0000	116000	12000	0.00 E+0
1.1592	0.0011	128000	12000	9.33 E-8
1.1603	0.0011	134000	6000	1.87 E-7
1.1609	0.0006	136000	2000	2.80 E-7
1.1614	0.0006	138000	2000	2.80 E-7
1.1631	0.0017	140000	2000	8.40 E-7
1.1665	0.0034	142000	2000	1.68 E-6
1.1726	0.0062	144000	2000	3.08 E-6
1.1794	0.0067	146000	2000	3.36 E-6
1.1872	0.0078	148000	2000	3.92 E-6
1.1950	0.0078	150000	2000	3.92 E-6
1.2012	0.0062	152000	2000	3.08 E-6
1.2085	0.0073	154000	2000	3.64 E-6

TABLE 209 (continued)  
VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	1.10 E-6	0.0006	500
2	2.80 E-7	0.0014	2000
3	9.33 E-8	0.0022	9000
4	4.67 E-8	0.0031	21000
5	0.00 E+0	0.0033	33000
6	0.00 E+0	0.0033	45000
7	0.00 E+0	0.0033	57000
8	0.00 E+0	0.0033	69000
9	0.00 E+0	0.0033	81000
10	4.67 E-8	0.0036	93000
11	0.00 E+0	0.0039	105000
12	9.33 E-8	0.0045	117000
13	1.87 E-7	0.0056	126000
14	2.80 E-7	0.0064	130000
15	2.80 E-7	0.0070	132000
16	8.40 E-7	0.0081	134000
17	1.68 E-6	0.0106	136000
18	3.08 E-6	0.0154	138000
19	3.36 E-6	0.0218	140000
20	3.92 E-6	0.0291	142000
21	3.92 E-6	0.0369	144000
22	3.08 E-6	0.0439	146000
23	3.64 E-6	0.0507	148000

VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0011	1000
2	0.0017	3000
3	0.0028	15000
4	0.0033	27000
5	0.0033	39000
6	0.0033	51000
7	0.0033	63000
8	0.0033	75000
9	0.0033	87000
10	0.0039	99000
11	0.0039	111000
12	0.0050	123000
13	0.0061	129000
14	0.0067	131000
15	0.0073	133000
16	0.0089	135000
17	0.0123	137000
18	0.0185	139000
19	0.0252	141000
20	0.0330	143000
21	0.0409	145000
22	0.0470	147000
23	0.0543	149000

Data adjusted to reflect growth of one crack tip.



TABLE 210

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 2-L-4, TENSION-TENSION  
 $F=12\text{Hz}$ ,  $K_2=7.78$ ,  $R=.128$ ,  $S=2.57$ ,  $U=20$ ,  $t@K_1=24\text{ Hr.}$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.5747	0.0028	2000	1000	2.80 E-6
1.5758	0.0011	4000	2000	5.60 E-7
1.5758	0.0000	16000	12000	0.00 E+0
1.5758	0.0000	28000	12000	0.00 E+0
1.5770	0.0011	40000	12000	9.33 E-8
1.5770	0.0000	52000	12000	0.00 E+0
1.5770	0.0000	64000	12000	0.00 E+0
1.5770	0.0000	76000	12000	0.00 E+0
1.5770	0.0000	88000	12000	0.00 E+0
1.5770	0.0000	100000	12000	0.00 E+0
1.5770	0.0000	112000	12000	0.00 E+0
1.5775	0.0006	124000	12000	4.67 E-8
1.5781	0.0006	136000	12000	4.67 E-8
1.5781	0.0000	148000	12000	0.00 E+0
1.5792	0.0011	160000	12000	9.33 E-8
1.5814	0.0022	172000	12000	1.87 E-7
1.5882	0.0067	178000	6000	1.12 E-6
1.5932	0.0050	180000	2000	2.52 E-6
1.6038	0.0106	182000	2000	5.32 E-6
1.6122	0.0084	184000	2000	4.20 E-6
1.6173	0.0050	186000	2000	2.52 E-6
1.6240	0.0067	188000	2000	3.36 E-6
1.6296	0.0056	190000	2000	2.80 E-6

TABLE 210 (continued)  
VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	2.80 E-6	0.0014	500
2	5.60 E-7	0.0034	2000
3	0.00 E+0	0.0039	9000
4	0.00 E+0	0.0039	21000
5	9.33 E-8	0.0045	33000
6	0.00 E+0	0.0050	45000
7	0.00 E+0	0.0050	57000
8	0.00 E+0	0.0050	69000
9	0.00 E+0	0.0050	81000
10	0.00 E+0	0.0050	93000
11	0.00 E+0	0.0050	105000
12	4.67 E-8	0.0053	117000
13	4.67 E-8	0.0059	129000
14	0.00 E+0	0.0062	141000
15	9.33 E-8	0.0067	153000
16	1.87 E-7	0.0084	165000
17	1.12 E-6	0.0129	174000
18	2.52 E-6	0.0188	178000
19	5.32 E-6	0.0266	180000
20	4.20 E-6	0.0361	182000
21	2.52 E-6	0.0428	184000
22	3.36 E-6	0.0487	186000
23	2.80 E-6	0.0549	188000

VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0028	1000
2	0.0039	3000
3	0.0039	15000
4	0.0039	27000
5	0.0050	39000
6	0.0050	51000
7	0.0050	63000
8	0.0050	75000
9	0.0050	87000
10	0.0050	99000
11	0.0050	111000
12	0.0056	123000
13	0.0062	135000
14	0.0062	147000
15	0.0073	159000
16	0.0095	171000
17	0.0162	177000
18	0.0213	179000
19	0.0319	181000
20	0.0403	183000
21	0.0454	185000
22	0.0521	187000
23	0.0577	189000

Data adjusted to reflect growth of one crack tip.

TABLE 211

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 5-1-11, TENSION-TENSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.5$ ,  $S=2.0$ ,  $U=20$ ,  $t\sigma K_1=0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.8078	0.0011	4000	1000	1.12 E-6
0.8084	0.0006	6000	2000	2.80 E-7
0.8086	0.0003	8000	2000	1.40 E-7
0.8089	0.0003	10000	2000	1.40 E-7
0.8095	0.0006	12000	2000	2.80 E-7
0.8100	0.0006	14000	2000	2.80 E-7
0.8109	0.0008	16000	2000	4.20 E-7
0.8120	0.0011	18000	2000	5.60 E-7
0.8137	0.0017	20000	2000	8.40 E-7
0.8154	0.0017	22000	2000	8.40 E-7
0.8170	0.0017	24000	2000	8.40 E-7
0.8196	0.0025	26000	2000	1.26 E-6
0.8224	0.0028	28000	2000	1.40 E-6
0.8257	0.0034	30000	2000	1.68 E-6
0.8285	0.0028	32000	2000	1.40 E-6
0.8313	0.0028	34000	2000	1.40 E-6
0.8347	0.0034	36000	2000	1.68 E-6
0.8380	0.0034	38000	2000	1.68 E-6
0.8406	0.0025	40000	2000	1.26 E-6
0.8439	0.0034	42000	2000	1.68 E-6

TABLE 211 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	1.12 E-6	0.0006	500
2	2.80 E-7	0.0014	2000
3	1.40 E-7	0.0018	4000
4	1.40 E-7	0.0021	6000
5	2.80 E-7	0.0025	8000
6	2.80 E-7	0.0031	10000
7	4.20 E-7	0.0038	12000
8	5.60 E-7	0.0048	14000
9	8.40 E-7	0.0062	16000
10	8.40 E-7	0.0078	18000
11	8.40 E-7	0.0095	20000
12	1.26 E-6	0.0116	22000
13	1.40 E-6	0.0143	24000
14	1.68 E-6	0.0174	26000
15	1.40 E-6	0.0204	28000
16	1.40 E-6	0.0232	30000
17	1.68 E-6	0.0263	32000
18	1.68 E-6	0.0297	34000
19	1.26 E-6	0.0326	36000
20	1.68 E-6	0.0356	38000

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0011	1000
2	0.0017	3000
3	0.0020	5000
4	0.0022	7000
5	0.0028	9000
6	0.0034	11000
7	0.0042	13000
8	0.0053	15000
9	0.0070	17000
10	0.0087	19000
11	0.0104	21000
12	0.0129	23000
13	0.0157	25000
14	0.0190	27000
15	0.0218	29000
16	0.0246	31000
17	0.0280	33000
18	0.0314	35000
19	0.0339	37000
20	0.0372	39000

TABLE 212

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
TEMPERATURE DESICCATED AIR

SPECIMEN NO. 5-L-11, TENSION-TENSION  
F=12Hz,  $K_2=10$ , R=0.5, S=2.0, U=20,  $t@K_1=15$  Min.

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.6703	0.0011	3000	1000	1.12 E-6
0.6706	0.0003	5000	2000	1.40 E-7
0.6709	0.0003	7000	2000	1.40 E-7
0.6714	0.0006	9000	2000	2.80 E-7
0.6720	0.0006	15000	6000	9.33 E-8
0.6720	0.0000	21000	6000	0.00 E+0
0.6728	0.0008	27000	6000	1.40 E-7
0.6751	0.0022	33000	6000	3.73 E-7
0.6776	0.0025	39000	6000	4.20 E-7
0.6790	0.0014	41000	2000	7.00 E-7
0.6804	0.0014	43000	2000	7.00 E-7
0.6826	0.0022	45000	2000	1.12 E-6
0.6846	0.0020	47000	2000	9.80 E-7
0.6877	0.0031	49000	2000	1.54 E-6
0.6916	0.0039	51000	2000	1.96 E-6
0.6950	0.0034	53000	2000	1.68 E-6
0.6972	0.0022	55000	2000	1.12 E-6
0.6997	0.0025	57000	2000	1.26 E-6
0.7025	0.0028	59000	2000	1.40 E-6
0.7073	0.0048	61000	2000	2.38 E-6
0.7112	0.0039	63000	2000	1.96 E-6
0.7140	0.0028	65000	2000	1.40 E-6
0.7171	0.0031	67000	2000	1.54 E-6

TABLE 212 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	1.12 E-6	0.0006	500
2	1.40 E-7	0.0013	2000
3	1.40 E-7	0.0015	4000
4	2.80 E-7	0.0020	6000
5	9.33 E-8	0.0025	10000
6	0.00 E+0	0.0028	16000
7	1.40 E-7	0.0032	22000
8	3.73 E-7	0.0048	28000
9	4.20 E-7	0.0071	34000
10	7.00 E-7	0.0091	38000
11	7.00 E-7	0.0105	40000
12	1.12 E-6	0.0123	42000
13	9.80 E-7	0.0144	44000
14	1.54 E-6	0.0169	46000
15	1.96 E-6	0.0204	48000
16	1.68 E-6	0.0241	50000
17	1.12 E-6	0.0269	52000
18	1.26 E-6	0.0293	54000
19	1.40 E-6	0.0319	56000
20	2.38 E-6	0.0357	58000
21	1.96 E-6	0.0400	60000
22	1.40 E-6	0.0434	62000
23	1.54 E-6	0.0463	64000

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0011	1000
2	0.0014	3000
3	0.0017	5000
4	0.0022	7000
5	0.0028	13000
6	0.0028	19000
7	0.0036	25000
8	0.0059	31000
9	0.0084	37000
10	0.0098	39000
11	0.0112	41000
12	0.0134	43000
13	0.0154	45000
14	0.0185	47000
15	0.0224	49000
16	0.0258	51000
17	0.0280	53000
18	0.0305	55000
19	0.0333	57000
20	0.0381	59000
21	0.0420	61000
22	0.0448	63000
23	0.0479	65000

TABLE 213

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 5-L-11, TENSION-TENSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.5$ ,  $S=2.0$ ,  $U=20$ ,  $t@K_1=60\text{ Min.}$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.5082	0.0020	1000	1000	1.96 E-6
0.5090	0.0008	3000	2000	4.20 E-7
0.5099	0.0008	5000	2000	4.20 E-7
0.5104	0.0006	7000	2000	2.80 E-7
0.5107	0.0003	9000	2000	1.40 E-7
0.5113	0.0006	11000	2000	2.80 E-7
0.5113	0.0000	13000	2000	0.00 E+0
0.5121	0.0008	15000	2000	4.20 E-7
0.5124	0.0003	17000	2000	1.40 E-7
0.5127	0.0003	19000	2000	1.40 E-7
0.5132	0.0006	21000	2000	2.80 E-7
0.5135	0.0003	23000	2000	1.40 E-7
0.5141	0.0006	25000	2000	2.80 E-7
0.5146	0.0006	27000	2000	2.80 E-7
0.5149	0.0003	29000	2000	1.40 E-7
0.5158	0.0008	31000	2000	4.20 E-7
0.5169	0.0011	33000	2000	5.60 E-7
0.5188	0.0020	35000	2000	9.80 E-7
0.5211	0.0022	37000	2000	1.12 E-6
0.5239	0.0028	39000	2000	1.40 E-6
0.5258	0.0020	41000	2000	9.80 E-7
0.5289	0.0031	43000	2000	1.54 E-6
0.5323	0.0034	45000	2000	1.68 E-6
0.5356	0.0034	47000	2000	1.68 E-6
0.5387	0.0031	49000	2000	1.54 E-6
0.5421	0.0034	51000	2000	1.68 E-6

TABLE 213 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	1.96 E-6	0.0010	500
2	4.20 E-7	0.0024	2000
3	4.20 E-7	0.0032	4000
4	2.80 E-7	0.0039	6000
5	1.40 E-7	0.0043	8000
6	2.80 E-7	0.0048	10000
7	0.00 E+0	0.0050	12000
8	4.20 E-7	0.0055	14000
9	1.40 E-7	0.0060	16000
10	1.40 E-7	0.0063	18000
11	2.80 E-7	0.0067	20000
12	1.40 E-7	0.0071	22000
13	2.80 E-7	0.0076	24000
14	2.80 E-7	0.0081	26000
15	1.40 E-7	0.0085	28000
16	4.20 E-7	0.0091	30000
17	5.60 E-7	0.0101	32000
18	9.80 E-7	0.0116	34000
19	1.12 E-6	0.0137	36000
20	1.40 E-6	0.0162	38000
21	9.80 E-7	0.0186	40000
22	1.54 E-6	0.0211	42000
23	1.68 E-6	0.0244	44000
24	1.68 E-6	0.0277	46000
25	1.54 E-6	0.0309	48000
26	1.68 E-6	0.0342	50000



TABLE 213 (continued)

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0020	1000
2	0.0028	3000
3	0.0036	5000
4	0.0042	7000
5	0.0045	9000
6	0.0050	11000
7	0.0050	13000
8	0.0059	15000
9	0.0062	17000
10	0.0064	19000
11	0.0070	21000
12	0.0073	23000
13	0.0078	25000
14	0.0084	27000
15	0.0087	29000
16	0.0095	31000
17	0.0106	33000
18	0.0126	35000
19	0.0148	37000
20	0.0176	39000
21	0.0196	41000
22	0.0227	43000
23	0.0260	45000
24	0.0294	47000
25	0.0325	49000
26	0.0358	51000

TABLE 214

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
TEMPERATURE DESICCATED AIR

SPECIMEN NO. 5-L-11, TENSION-TENSION

F=12Hz,  $K_2=10$ , R=0.5, S=2.0, U=20,  $t@K_1=4$  Hr.

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.6289	0.0014	13000	1000	1.40 E-6
0.6292	0.0003	15000	2000	1.40 E-7
0.6294	0.0003	17000	2000	1.40 E-7
0.6297	0.0003	19000	2000	1.40 E-7
0.6303	0.0006	25000	6000	9.33 E-8
0.6308	0.0006	31000	6000	9.33 E-8
0.6317	0.0008	37000	6000	1.40 E-7
0.6322	0.0006	43000	6000	9.33 E-8
0.6353	0.0031	49000	6000	5.13 E-7
0.6362	0.0008	51000	2000	4.20 E-7
0.6370	0.0008	53000	2000	4.20 E-7
0.6376	0.0006	55000	2000	2.80 E-7
0.6384	0.0008	57000	2000	4.20 E-7
0.6401	0.0017	59000	2000	8.40 E-7
0.6420	0.0020	61000	2000	9.80 E-7
0.6440	0.0020	63000	2000	9.80 E-7
0.6468	0.0028	65000	2000	1.40 E-6
0.6496	0.0028	67000	2000	1.40 E-6
0.6524	0.0028	69000	2000	1.40 E-6
0.6566	0.0042	71000	2000	2.10 E-6
0.6594	0.0028	73000	2000	1.40 E-6
0.6628	0.0034	75000	2000	1.68 E-6
0.6658	0.0031	77000	2000	1.54 E-6

TABLE 214 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	1.40 E-6	0.0007	500
2	1.40 E-7	0.0015	2000
3	1.40 E-7	0.0018	4000
4	1.40 E-7	0.0021	6000
5	9.33 E-8	0.0025	10000
6	9.33 E-8	0.0031	16000
7	1.40 E-7	0.0038	22000
8	9.33 E-8	0.0045	28000
9	5.13 E-7	0.0063	34000
10	4.20 E-7	0.0083	38000
11	4.20 E-7	0.0091	40000
12	2.80 E-7	0.0098	42000
13	4.20 E-7	0.0105	44000
14	8.40 E-7	0.0118	46000
15	9.80 E-7	0.0136	48000
16	9.80 E-7	0.0155	50000
17	1.40 E-6	0.0179	52000
18	1.40 E-6	0.0207	54000
19	1.40 E-6	0.0235	56000
20	2.10 E-6	0.0270	58000
21	1.40 E-6	0.0305	60000
22	1.68 E-6	0.0336	62000
23	1.54 E-6	0.0368	64000

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0014	1000
2	0.0017	3000
3	0.0020	5000
4	0.0022	7000
5	0.0028	13000
6	0.0034	19000
7	0.0042	25000
8	0.0048	31000
9	0.0078	37000
10	0.0087	39000
11	0.0095	41000
12	0.0101	43000
13	0.0109	45000
14	0.0126	47000
15	0.0146	49000
16	0.0165	51000
17	0.0193	53000
18	0.0221	55000
19	0.0249	57000
20	0.0291	59000
21	0.0319	61000
22	0.0353	63000
23	0.0384	65000

(518)

TABLE 215

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
TEMPERATURE DESICCATED AIR

SPECIMEN NO. 5-L-11, TENSION-TENSION

F=12Hz,  $K_2=10$ , R=0.5, S=2.0, U=20,  $t@K_1=24$  Hr.

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.5508	0.0003	5000	1000	2.80 E-7
0.5513	0.0006	7000	2000	2.80 E-7
0.5516	0.0003	9000	2000	1.40 E-7
0.5516	0.0000	11000	2000	0.00 E+0
0.5527	0.0011	17000	6000	1.87 E-7
0.5536	0.0008	23000	6000	1.40 E-7
0.5544	0.0008	29000	6000	1.40 E-7
0.5555	0.0011	35000	6000	1.87 E-7
0.5561	0.0006	41000	6000	9.33 E-8
0.5569	0.0008	47000	6000	1.40 E-7
0.5575	0.0006	53000	6000	9.33 E-8
0.5594	0.0020	59000	6000	3.27 E-7
0.5608	0.0014	61000	2000	7.00 E-7
0.5625	0.0017	63000	2000	8.40 E-7
0.5639	0.0014	65000	2000	7.00 E-7
0.5662	0.0022	67000	2000	1.12 E-6
0.5684	0.0022	69000	2000	1.12 E-6
0.5706	0.0022	71000	2000	1.12 E-6
0.5743	0.0036	73000	2000	1.82 E-6
0.5774	0.0031	75000	2000	1.54 E-6
0.5802	0.0028	77000	2000	1.40 E-6
0.5835	0.0034	79000	2000	1.68 E-6
0.5877	0.0042	81000	2000	2.10 E-6
0.5908	0.0031	83000	2000	1.54 E-6
0.5944	0.0036	85000	2000	1.82 E-6
0.5984	0.0039	87000	2000	1.96 E-6
0.6012	0.0028	89000	2000	1.40 E-6
0.6048	0.0036	91000	2000	1.82 E-6
0.6087	0.0039	93000	2000	1.96 E-6

TABLE 215 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	2.80 E-7	0.0001	500
2	2.80 E-7	0.0006	2000
3	1.40 E-7	0.0010	4000
4	0.00 E+0	0.0011	6000
5	1.87 E-7	0.0017	10000
6	1.40 E-7	0.0027	16000
7	1.40 E-7	0.0035	22000
8	1.87 E-7	0.0045	28000
9	9.33 E-8	0.0053	34000
10	1.40 E-7	0.0060	40000
11	9.33 E-8	0.0067	46000
12	3.27 E-7	0.0080	52000
13	7.00 E-7	0.0097	56000
14	8.40 E-7	0.0112	58000
15	7.00 E-7	0.0127	60000
16	1.12 E-6	0.0146	62000
17	1.12 E-6	0.0168	64000
18	1.12 E-6	0.0190	66000
19	1.82 E-6	0.0220	68000
20	1.54 E-6	0.0253	70000
21	1.40 E-6	0.0283	72000
22	1.68 E-6	0.0314	74000
23	2.10 E-6	0.0351	76000
24	1.54 E-6	0.0388	78000
25	1.82 E-6	0.0421	80000
26	1.96 E-6	0.0459	82000
27	1.40 E-6	0.0493	84000
28	1.82 E-6	0.0525	86000
29	1.96 E-6	0.0563	88000

TABLE 215 (continued)

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0003	1000
2	0.0008	3000
3	0.0011	5000
4	0.0011	7000
5	0.0022	13000
6	0.0031	19000
7	0.0039	25000
8	0.0050	31000
9	0.0056	37000
10	0.0064	43000
11	0.0070	49000
12	0.0090	55000
13	0.0104	57000
14	0.0120	59000
15	0.0134	61000
16	0.0157	63000
17	0.0179	65000
18	0.0202	67000
19	0.0238	69000
20	0.0269	71000
21	0.0297	73000
22	0.0330	75000
23	0.0372	77000
24	0.0403	79000
25	0.0440	81000
26	0.0479	83000
27	0.0507	85000
28	0.0543	87000
29	0.0582	89000

TABLE 216

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 3-L-16, TENSION-TENSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.5$ ,  $S=2.0$ ,  $U=4$ ,  $t@K_1=0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.6821	0.0011	3000	1000	1.12 E-6
0.6824	0.0003	11000	8000	3.50 E-8
0.6840	0.0017	19000	8000	2.10 E-7
0.6840	0.0000	27000	8000	0.00 E+0
0.6846	0.0006	35000	8000	7.00 E-8
0.6860	0.0014	43000	8000	1.75 E-7
0.6922	0.0062	47000	4000	1.54 E-6
0.6947	0.0025	49000	2000	1.26 E-6
0.6986	0.0039	51000	2000	1.96 E-6
0.7025	0.0039	53000	2000	1.96 E-6
0.7059	0.0034	55000	2000	1.68 E-6
0.7095	0.0036	57000	2000	1.82 E-6
0.7140	0.0045	59000	2000	2.24 E-6
0.7176	0.0036	61000	2000	1.82 E-6
0.7210	0.0034	63000	2000	1.68 E-6

TABLE 216 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	1.12 E-6	0.0006	500
2	3.50 E-8	0.0013	5000
3	2.10 E-7	0.0022	13000
4	0.00 E+0	0.0031	21000
5	7.00 E-8	0.0034	29000
6	1.75 E-7	0.0043	37000
7	1.54 E-6	0.0081	43000
8	1.26 E-6	0.0125	46000
9	1.96 E-6	0.0157	48000
10	1.96 E-6	0.0196	50000
11	1.68 E-6	0.0232	52000
12	1.82 E-6	0.0267	54000
13	2.24 E-6	0.0308	56000
14	1.82 E-6	0.0349	58000
15	1.68 E-6	0.0384	60000

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0011	1000
2	0.0014	9000
3	0.0031	17000
4	0.0031	25000
5	0.0036	33000
6	0.0050	41000
7	0.0112	45000
8	0.0137	47000
9	0.0176	49000
10	0.0216	51000
11	0.0249	53000
12	0.0286	55000
13	0.0330	57000
14	0.0367	59000
15	0.0400	61000



TABLE 217

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 3-L-16, TENSION-TENSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.5$ ,  $S=2.0$ ,  $U=4$ ,  $t@K_1=15$  Min.

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.6188	0.0008	2000	1000	8.40 E-7
0.6196	0.0008	10000	8000	1.05 E-7
0.6199	0.0003	18000	8000	3.50 E-8
0.6202	0.0003	26000	8000	3.50 E-8
0.6202	0.0000	34000	8000	0.00 E+0
0.6202	0.0000	42000	8000	0.00 E+0
0.6202	0.0000	50000	8000	0.00 E+0
0.6202	0.0000	58000	8000	0.00 E+0
0.6202	0.0000	66000	8000	0.00 E+0
0.6202	0.0000	74000	8000	0.00 E+0
0.6216	0.0014	78000	4000	3.50 E-7
0.6233	0.0017	82000	4000	4.20 E-7
0.6250	0.0017	86000	4000	4.20 E-7
0.6311	0.0062	90000	4000	1.54 E-6
0.6401	0.0090	94000	4000	2.24 E-6
0.6488	0.0087	98000	4000	2.17 E-6
0.6569	0.0081	102000	4000	2.03 E-6
0.6644	0.0076	106000	4000	1.89 E-6
0.6726	0.0081	110000	4000	2.03 E-6
0.6784	0.0059	114000	4000	1.47 E-6

TABLE 217 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	8.40 E-7	0.0004	500
2	1.05 E-7	0.0013	5000
3	3.50 E-8	0.0018	13000
4	3.50 E-8	0.0021	21000
5	0.00 E+0	0.0022	29000
6	0.00 E+0	0.0022	37000
7	0.00 E+0	0.0022	45000
8	0.00 E+0	0.0022	53000
9	0.00 E+0	0.0022	61000
10	0.00 E+0	0.0022	69000
11	3.50 E-7	0.0029	75000
12	4.20 E-7	0.0045	79000
13	4.20 E-7	0.0062	83000
14	1.54 E-6	0.0101	87000
15	2.24 E-6	0.0176	91000
16	2.17 E-6	0.0265	95000
17	2.03 E-6	0.0349	99000
18	1.89 E-6	0.0427	103000
19	2.03 E-6	0.0505	107000
20	1.47 E-6	0.0575	111000

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0008	1000
2	0.0017	9000
3	0.0020	17000
4	0.0022	25000
5	0.0022	33000
6	0.0022	41000
7	0.0022	49000
8	0.0022	57000
9	0.0022	65000
10	0.0022	73000
11	0.0036	77000
12	0.0053	81000
13	0.0070	85000
14	0.0132	89000
15	0.0221	93000
16	0.0308	97000
17	0.0389	101000
18	0.0465	105000
19	0.0546	109000
20	0.0605	113000

TABLE 218

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 3-L-16, TENSION-TENSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.5$ ,  $S=2.0$ ,  $U=4$ ,  $t@K_1=60\text{ Min.}$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.4690	0.0011	3000	1000	1.12 E-6
0.4701	0.0011	11000	8000	1.40 E-7
0.4701	0.0000	19000	8000	0.00 E+0
0.4701	0.0000	27000	8000	0.00 E+0
0.4701	0.0000	35000	8000	0.00 E+0
0.4701	0.0000	43000	8000	0.00 E+0
0.4701	0.0000	51000	8000	0.00 E+0
0.4701	0.0000	59000	8000	0.00 E+0
0.4701	0.0000	67000	8000	0.00 E+0
0.4701	0.0000	75000	8000	0.00 E+0
0.4701	0.0000	83000	8000	0.00 E+0
0.4718	0.0017	91000	8000	2.10 E-7
0.4752	0.0034	99000	8000	4.20 E-7
0.4799	0.0048	103000	4000	1.19 E-6
0.4894	0.0095	107000	4000	2.38 E-6
0.4976	0.0081	111000	4000	2.03 E-6
0.5046	0.0070	115000	4000	1.75 E-6
0.5113	0.0067	119000	4000	1.68 E-6
0.5194	0.0081	123000	4000	2.03 E-6
0.5244	0.0050	127000	4000	1.26 E-6
0.5317	0.0073	131000	4000	1.82 E-6

TABLE 218 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	1.12 E-6	0.0006	500
2	1.40 E-7	0.0017	5000
3	0.00 E+0	0.0022	13000
4	0.00 E+0	0.0022	21000
5	0.00 E+0	0.0022	29000
6	0.00 E+0	0.0022	37000
7	0.00 E+0	0.0022	45000
8	0.00 E+0	0.0022	53000
9	0.00 E+0	0.0022	61000
10	0.00 E+0	0.0022	69000
11	0.00 E+0	0.0022	77000
12	2.10 E-7	0.0031	85000
13	4.20 E-7	0.0056	93000
14	1.19 E-6	0.0097	99000
15	2.38 E-6	0.0168	103000
16	2.03 E-6	0.0256	107000
17	1.75 E-6	0.0332	111000
18	1.68 E-6	0.0400	115000
19	2.03 E-6	0.0475	119000
20	1.26 E-6	0.0540	123000
21	1.82 E-6	0.0602	127000

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0011	1000
2	0.0022	9000
3	0.0022	17000
4	0.0022	25000
5	0.0022	33000
6	0.0022	41000
7	0.0022	49000
8	0.0022	57000
9	0.0022	65000
10	0.0022	73000
11	0.0022	81000
12	0.0039	89000
13	0.0073	97000
14	0.0120	101000
15	0.0216	105000
16	0.0297	109000
17	0.0367	113000
18	0.0434	117000
19	0.0515	121000
20	0.0566	125000
21	0.0638	129000

TABLE 219

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 3-1-16, TENSION-TENSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.5$ ,  $S=2.0$ ,  $U=4$ ,  $t@K_1=4\text{ Hr.}$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.5466	0.0020	9250	1000	1.96 E-6
0.5466	0.0000	17250	8000	0.00 E+0
0.5466	0.0000	25250	8000	0.00 E+0
0.5466	0.0000	33250	8000	0.00 E+0
0.5466	0.0000	41250	8000	0.00 E+0
0.5466	0.0000	49250	8000	0.00 E+0
0.5466	0.0000	57250	8000	0.00 E+0
0.5466	0.0000	65250	8000	0.00 E+0
0.5466	0.0000	73250	8000	0.00 E+0
0.5466	0.0000	81250	8000	0.00 E+0
0.5466	0.0000	89250	8000	0.00 E+0
0.5466	0.0000	97250	8000	0.00 E+0
0.5466	0.0000	105250	8000	0.00 E+0
0.5466	0.0000	113250	8000	0.00 E+0
0.5466	0.0000	121250	8000	0.00 E+0
0.5491	0.0025	129250	8000	3.15 E-7
0.5524	0.0034	133250	4000	8.40 E-7
0.5578	0.0053	137250	4000	1.33 E-6
0.5634	0.0056	141250	4000	1.40 E-6
0.5692	0.0059	145250	4000	1.47 E-6
0.5785	0.0092	149250	4000	2.31 E-6
0.5880	0.0095	153250	4000	2.38 E-6
0.5947	0.0067	157250	4000	1.68 E-6
0.6020	0.0073	161250	4000	1.82 E-6
0.6090	0.0070	165250	4000	1.75 E-6
0.6157	0.0067	169250	4000	1.68 E-6

TABLE 219 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	1.96 E-6	0.0010	500
2	0.00 E+0	0.0020	5000
3	0.00 E+0	0.0020	13000
4	0.00 E+0	0.0020	21000
5	0.00 E+0	0.0020	29000
6	0.00 E+0	0.0020	37000
7	0.00 E+0	0.0020	45000
8	0.00 E+0	0.0020	53000
9	0.00 E+0	0.0020	61000
10	0.00 E+0	0.0020	69000
11	0.00 E+0	0.0020	77000
12	0.00 E+0	0.0020	85000
13	0.00 E+0	0.0020	93000
14	0.00 E+0	0.0020	101000
15	0.00 E+0	0.0020	109000
16	3.15 E-7	0.0032	117000
17	8.40 E-7	0.0062	123000
18	1.33 E-6	0.0105	127000
19	1.40 E-6	0.0160	131000
20	1.47 E-6	0.0217	135000
21	2.31 E-6	0.0293	139000
22	2.38 E-6	0.0386	143000
23	1.68 E-6	0.0468	147000
24	1.82 E-6	0.0538	151000
25	1.75 E-6	0.0609	155000
26	1.68 E-6	0.0678	159000

TABLE 219 (continued)

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0020	1000
2	0.0020	9000
3	0.0020	17000
4	0.0020	25000
5	0.0020	33000
6	0.0020	41000
7	0.0020	49000
8	0.0020	57000
9	0.0020	65000
10	0.0020	73000
11	0.0020	81000
12	0.0020	89000
13	0.0020	97000
14	0.0020	105000
15	0.0020	113000
16	0.0045	121000
17	0.0078	125000
18	0.0132	129000
19	0.0188	133000
20	0.0246	137000
21	0.0339	141000
22	0.0434	145000
23	0.0501	149000
24	0.0574	153000
25	0.0644	157000
26	0.0711	161000

TABLE 220

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 5-L-11, TENSION-TENSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.5$ ,  $S=2.0$ ,  $U=4$ ,  $t@K_1=24\text{ Hr.}$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.9923	0.0011	16000	1000	1.12 E-6
0.9934	0.0011	24000	8000	1.40 E-7
0.9934	0.0000	32000	8000	0.00 E+0
0.9934	0.0000	40000	8000	0.00 E+0
0.9934	0.0000	104000	64000	0.00 E+0
0.9951	0.0017	168000	64000	2.63 E-8
0.9951	0.0000	232000	64000	0.00 E+0
0.9951	0.0000	296000	64000	0.00 E+0
0.9951	0.0000	360000	64000	0.00 E+0
0.9951	0.0000	424000	64000	0.00 E+0
0.9951	0.0000	488000	64000	0.00 E+0
0.9951	0.0000	552000	64000	0.00 E+0
0.9951	0.0000	564500	12500	0.00 E+0
0.9968	0.0017	577000	12500	1.34 E-7
0.9985	0.0017	581000	4000	4.20 E-7
1.0086	0.0101	585000	4000	2.52 E-6
1.0192	0.0106	589000	4000	2.66 E-6
1.0304	0.0112	593000	4000	2.80 E-6
1.0371	0.0067	597000	4000	1.68 E-6
1.0438	0.0067	601000	4000	1.68 E-6
1.0517	0.0078	605000	4000	1.96 E-6
1.0573	0.0056	609000	4000	1.40 E-6
1.0629	0.0056	613000	4000	1.40 E-6
1.0662	0.0034	617000	4000	8.40 E-7
1.0746	0.0084	621000	4000	2.10 E-6
1.0791	0.0045	625000	4000	1.12 E-6
1.0853	0.0062	629000	4000	1.54 E-6
1.0903	0.0050	633000	4000	1.26 E-6
1.0959	0.0056	637000	4000	1.40 E-6



TABLE 220 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	1.12 E-6	0.0006	500
2	1.40 E-7	0.0017	5000
3	0.00 E+0	0.0022	13000
4	0.00 E+0	0.0022	21000
5	0.00 E+0	0.0022	57000
6	2.63 E-8	0.0031	121000
7	0.00 E+0	0.0039	185000
8	0.00 E+0	0.0039	249000
9	0.00 E+0	0.0039	313000
10	0.00 E+0	0.0039	377000
11	0.00 E+0	0.0039	441000
12	0.00 E+0	0.0039	505000
13	0.00 E+0	0.0039	543250
14	1.34 E-7	0.0048	555750
15	4.20 E-7	0.0064	564000
16	2.52 E-6	0.0123	568000
17	2.66 E-6	0.0227	572000
18	2.80 E-6	0.0336	576000
19	1.68 E-6	0.0426	580000
20	1.68 E-6	0.0493	584000
21	1.96 E-6	0.0566	588000
22	1.40 E-6	0.0633	592000
23	1.40 E-6	0.0689	596000
24	8.40 E-7	0.0734	600000
25	2.10 E-6	0.0792	604000
26	1.12 E-6	0.0857	608000
27	1.54 E-6	0.0910	612000
28	1.26 E-6	0.0966	616000
29	1.40 E-6	0.1019	620000

TABLE 220 (continued)

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0011	1000
2	0.0022	9000
3	0.0022	17000
4	0.0022	25000
5	0.0022	89000
6	0.0039	153000
7	0.0039	217000
8	0.0039	281000
9	0.0039	345000
10	0.0039	409000
11	0.0039	473000
12	0.0039	537000
13	0.0039	549500
14	0.0056	562000
15	0.0073	566000
16	0.0174	570000
17	0.0280	574000
18	0.0392	578000
19	0.0459	582000
20	0.0526	586000
21	0.0605	590000
22	0.0661	594000
23	0.0717	598000
24	0.0750	602000
25	0.0834	606000
26	0.0879	610000
27	0.0941	614000
28	0.0991	618000
29	0.1047	622000

Data adjusted to reflect growth of one crack tip.

Data Tabulations for Tension-Compression Load  
Class with Hold Time in Compression

TABLE 221

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 4-L-1, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.1$ ,  $S=2.0$ ,  $U_c = -.8$ ,  $t@K_5=0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.6140	0.0050	2000	1000	5.04 E-6
0.6191	0.0050	4000	2000	2.52 E-6
0.6210	0.0020	5000	1000	1.96 E-6
0.6238	0.0028	6000	1000	2.80 E-6
0.6275	0.0036	7000	1000	3.64 E-6
0.6314	0.0039	8000	1000	3.92 E-6
0.6356	0.0042	9000	1000	4.20 E-6
0.6401	0.0045	10000	1000	4.48 E-6
0.6460	0.0059	11000	1000	5.88 E-6
0.6516	0.0056	12000	1000	5.60 E-6
0.6563	0.0048	13000	1000	4.76 E-6
0.6608	0.0045	14000	1000	4.48 E-6
0.6667	0.0059	15000	1000	5.88 E-6

TABLE 221 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	5.04 E-6	0.0025	500
2	2.52 E-6	0.0076	2000
3	1.96 E-6	0.0111	3500
4	2.80 E-6	0.0134	4500
5	3.64 E-6	0.0167	5500
6	3.92 E-6	0.0204	6500
7	4.20 E-6	0.0245	7500
8	4.48 E-6	0.0288	8500
9	5.88 E-6	0.0340	9500
10	5.60 E-6	0.0398	10500
11	4.76 E-6	0.0449	11500
12	4.48 E-6	0.0496	12500
13	5.88 E-6	0.0547	13500

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0050	1000
2	0.0101	3000
3	0.0120	4000
4	0.0148	5000
5	0.0185	6000
6	0.0224	7000
7	0.0266	8000
8	0.0311	9000
9	0.0370	10000
10	0.0426	11000
11	0.0473	12000
12	0.0518	13000
13	0.0577	14000

TABLE 222

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 4-I-1, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.1$ ,  $S=2.0$ ,  $U_c=-.8$ ,  $t@K_5=15$  Min.

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.5477	0.0053	4000	1000	5.32 E-6
0.5527	0.0050	6000	2000	2.52 E-6
0.5561	0.0034	7000	1000	3.36 E-6
0.5597	0.0036	8000	1000	3.64 E-6
0.5634	0.0036	9000	1000	3.64 E-6
0.5692	0.0059	10000	1000	5.88 E-6
0.5734	0.0042	11000	1000	4.20 E-6
0.5788	0.0053	12000	1000	5.32 E-6
0.5830	0.0042	13000	1000	4.20 E-6
0.5872	0.0042	14000	1000	4.20 E-6
0.5925	0.0053	15000	1000	5.32 E-6
0.5986	0.0062	16000	1000	6.16 E-6
0.6042	0.0056	17000	1000	5.60 E-6

TABLE 222 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	5.32 E-6	0.0027	500
2	2.52 E-6	0.0078	2000
3	3.36 E-6	0.0120	3500
4	3.64 E-6	0.0155	4500
5	3.64 E-6	0.0192	5500
6	5.88 E-6	0.0239	6500
7	4.20 E-6	0.0290	7500
8	5.32 E-6	0.0337	8500
9	4.20 E-6	0.0385	9500
10	4.20 E-6	0.0427	10500
11	5.32 E-6	0.0475	11500
12	6.16 E-6	0.0532	12500
13	5.60 E-6	0.0591	13500

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0053	1000
2	0.0104	3000
3	0.0137	4000
4	0.0174	5000
5	0.0210	6000
6	0.0269	7000
7	0.0311	8000
8	0.0364	9000
9	0.0406	10000
10	0.0448	11000
11	0.0501	12000
12	0.0563	13000
13	0.0619	14000

TABLE 223

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 4-L-1, TENSION-COMPRESSION  
 F=12Hz,  $K_2=10$ ,  $R=0.1$ ,  $S=2.0$ ,  $U_c = -.8$ ,  $t@K_5=60$  Min.

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.4791	0.0050	1000	1000	5.04 E-6
0.4844	0.0053	3000	2000	2.66 E-6
0.4920	0.0076	5000	2000	3.78 E-6
0.4962	0.0042	6000	1000	4.20 E-6
0.5004	0.0042	7000	1000	4.20 E-6
0.5057	0.0053	8000	1000	5.32 E-6
0.5110	0.0053	9000	1000	5.32 E-6
0.5158	0.0048	10000	1000	4.76 E-6
0.5219	0.0062	11000	1000	6.16 E-6
0.5270	0.0050	12000	1000	5.04 E-6

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	5.04 E-6	0.0025	500
2	2.66 E-6	0.0077	2000
3	3.78 E-6	0.0141	4000
4	4.20 E-6	0.0200	5500
5	4.20 E-6	0.0242	6500
6	5.32 E-6	0.0290	7500
7	5.32 E-6	0.0343	8500
8	4.76 E-6	0.0393	9500
9	6.16 E-6	0.0448	10500
10	5.04 E-6	0.0504	11500

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0050	1000
2	0.0104	3000
3	0.0179	5000
4	0.0221	6000
5	0.0263	7000
6	0.0316	8000
7	0.0370	9000
8	0.0417	10000
9	0.0479	11000
10	0.0529	12000

(539)



TABLE 224

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 4-L-1, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.1$ ,  $S=2.0$ ,  $U_c = -.8$ ,  $t@K_5=24\text{ Hr.}$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.7014	0.0067	7000	1000	6.72 E-6
0.7031	0.0017	8000	1000	1.68 E-6
0.7076	0.0045	9000	1000	4.48 E-6
0.7112	0.0036	10000	1000	3.64 E-6
0.7151	0.0039	11000	1000	3.92 E-6
0.7193	0.0042	12000	1000	4.20 E-6
0.7238	0.0045	13000	1000	4.48 E-6
0.7280	0.0042	14000	1000	4.20 E-6
0.7333	0.0053	15000	1000	5.32 E-6
0.7384	0.0050	16000	1000	5.04 E-6
0.7434	0.0050	17000	1000	5.04 E-6
0.7493	0.0059	18000	1000	5.88 E-6
0.7543	0.0050	19000	1000	5.04 E-6

TABLE 224 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	6.72 E-6	0.0034	500
2	1.68 E-6	0.0076	1500
3	4.48 E-6	0.0106	2500
4	3.64 E-6	0.0147	3500
5	3.92 E-6	0.0185	4500
6	4.20 E-6	0.0225	5500
7	4.48 E-6	0.0269	6500
8	4.20 E-6	0.0312	7500
9	5.32 E-6	0.0360	8500
10	5.04 E-6	0.0412	9500
11	5.04 E-6	0.0462	10500
12	5.88 E-6	0.0517	11500
13	5.04 E-6	0.0571	12500

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0067	1000
2	0.0084	2000
3	0.0129	3000
4	0.0165	4000
5	0.0204	5000
6	0.0246	6000
7	0.0291	7000
8	0.0333	8000
9	0.0386	9000
10	0.0437	10000
11	0.0487	11000
12	0.0546	12000
13	0.0596	13000

TABLE 225

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 5-L-11, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.1$ ,  $S=2.5$ ,  $U_c = -1$ ,  $t@K_5=15\text{ Min.}$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.3059	0.0053	3000	1000	5.32 E-6
1.3093	0.0034	5000	2000	1.68 E-6
1.3115	0.0022	7000	2000	1.12 E-6
1.3129	0.0014	8000	1000	1.40 E-6
1.3160	0.0031	9000	1000	3.08 E-6
1.3191	0.0031	10000	1000	3.08 E-6
1.3208	0.0017	11000	1000	1.68 E-6
1.3236	0.0028	12000	1000	2.80 E-6
1.3272	0.0036	13000	1000	3.64 E-6
1.3308	0.0036	14000	1000	3.64 E-6
1.3359	0.0050	15000	1000	5.04 E-6
1.3395	0.0036	16000	1000	3.64 E-6
1.3446	0.0050	17000	1000	5.04 E-6
1.3502	0.0056	18000	1000	5.60 E-6
1.3546	0.0045	19000	1000	4.48 E-6
1.3600	0.0053	20000	1000	5.32 E-6
1.3639	0.0039	21000	1000	3.92 E-6
1.3692	0.0053	22000	1000	5.32 E-6
1.3748	0.0056	23000	1000	5.60 E-6
1.3798	0.0050	24000	1000	5.04 E-6

Data for  $t@K_5=0$  are in Table 131, page 70.

TABLE 225 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	5.32 E-6	0.0027	500
2	1.68 E-6	0.0070	2000
3	1.12 E-6	0.0098	4000
4	1.40 E-6	0.0116	5500
5	3.08 E-6	0.0139	6500
6	3.08 E-6	0.0169	7500
7	1.68 E-6	0.0193	8500
8	2.80 E-6	0.0216	9500
9	3.64 E-6	0.0248	10500
10	3.64 E-6	0.0284	11500
11	5.04 E-6	0.0328	12500
12	3.64 E-6	0.0371	13500
13	5.04 E-6	0.0414	14500
14	5.60 E-6	0.0468	15500
15	4.48 E-6	0.0518	16500
16	5.32 E-6	0.0567	17500
17	3.92 E-6	0.0613	18500
18	5.32 E-6	0.0659	19500
19	5.60 E-6	0.0714	20500
20	5.04 E-6	0.0767	21500

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0053	1000
2	0.0087	3000
3	0.0109	5000
4	0.0123	6000
5	0.0154	7000
6	0.0185	8000
7	0.0202	9000
8	0.0230	10000
9	0.0266	11000
10	0.0302	12000
11	0.0353	13000
12	0.0389	14000
13	0.0440	15000
14	0.0496	16000
15	0.0540	17000
16	0.0594	18000
17	0.0633	19000
18	0.0686	20000
19	0.0742	21000
20	0.0792	22000

TABLE 226

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 5-L-11, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.1$ ,  $S=2.5$ ,  $U_c=-1$ ,  $t@K_5=60$  Min.

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.2071	0.0059	2000	1000	5.88 E-6
1.2135	0.0064	6000	4000	1.61 E-6
1.2180	0.0045	8000	2000	2.24 E-6
1.2205	0.0025	9000	1000	2.52 E-6
1.2239	0.0034	10000	1000	3.36 E-6
1.2267	0.0028	11000	1000	2.80 E-6
1.2300	0.0034	12000	1000	3.36 E-6
1.2340	0.0039	13000	1000	3.92 E-6
1.2379	0.0039	14000	1000	3.92 E-6
1.2438	0.0059	15000	1000	5.88 E-6
1.2480	0.0042	16000	1000	4.20 E-6
1.2527	0.0043	17000	1000	4.76 E-6
1.2575	0.0048	18000	1000	4.76 E-6
1.2620	0.0045	19000	1000	4.48 E-6
1.2684	0.0064	20000	1000	6.44 E-6
1.2734	0.0050	21000	1000	5.04 E-6
1.2782	0.0048	22000	1000	4.76 E-6
1.2838	0.0056	23000	1000	5.60 E-6
1.2891	0.0053	24000	1000	5.32 E-6

TABLE 226 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	5.88 E-6	0.0029	500
2	1.61 E-6	0.0091	3000
3	2.24 E-6	0.0146	6000
4	2.52 E-6	0.0181	7500
5	3.36 E-6	0.0210	8500
6	2.80 E-6	0.0241	9500
7	3.36 E-6	0.0272	10500
8	3.92 E-6	0.0308	11500
9	3.92 E-6	0.0347	12500
10	5.88 E-6	0.0396	13500
11	4.20 E-6	0.0447	14500
12	4.76 E-6	0.0491	15500
13	4.76 E-6	0.0539	16500
14	4.48 E-6	0.0585	17500
15	6.44 E-6	0.0640	18500
16	5.04 E-6	0.0697	19500
17	4.76 E-6	0.0746	20500
18	5.60 E-6	0.0798	21500
19	5.32 E-6	0.0853	22500

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0059	1000
2	0.0123	5000
3	0.0163	7000
4	0.0193	8000
5	0.0227	9000
6	0.0255	10000
7	0.0288	11000
8	0.0328	12000
9	0.0367	13000
10	0.0426	14000
11	0.0468	15000
12	0.0515	16000
13	0.0563	17000
14	0.0608	18000
15	0.0672	19000
16	0.0722	20000
17	0.0770	21000
18	0.0826	22000
19	0.0879	23000

TABLE 227

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 5-I-11, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.1$ ,  $S=2.5$ ,  $U_c = -1$ ,  $t@K_5=24\text{ Hr.}$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.4451	0.0076	5000	1000	7.56 E-6
1.4487	0.0036	7000	2000	1.82 E-6
1.4521	0.0034	9000	2000	1.68 E-6
1.4549	0.0028	10000	1000	2.80 E-6
1.4577	0.0028	11000	1000	2.80 E-6
1.4599	0.0022	12000	1000	2.24 E-6
1.4627	0.0028	13000	1000	2.80 E-6
1.4666	0.0039	14000	1000	3.92 E-6
1.4706	0.0039	15000	1000	3.92 E-6
1.4736	0.0031	16000	1000	3.08 E-6
1.4781	0.0045	17000	1000	4.48 E-6
1.4829	0.0048	18000	1000	4.76 E-6
1.4874	0.0045	19000	1000	4.48 E-6
1.4921	0.0048	20000	1000	4.76 E-6
1.4969	0.0048	21000	1000	4.76 E-6
1.5014	0.0045	22000	1000	4.48 E-6
1.5075	0.0062	23000	1000	6.16 E-6
1.5123	0.0048	24000	1000	4.76 E-6

TABLE 227 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	7.56 E-6	0.0038	500
2	1.82 E-6	0.0094	2000
3	1.68 E-6	0.0129	4000
4	2.80 E-6	0.0160	5500
5	2.80 E-6	0.0188	6500
6	2.24 E-6	0.0213	7500
7	2.80 E-6	0.0238	8500
8	3.92 E-6	0.0272	9500
9	3.92 E-6	0.0311	10500
10	3.08 E-6	0.0346	11500
11	4.48 E-6	0.0384	12500
12	4.76 E-6	0.0430	13500
13	4.48 E-6	0.0476	14500
14	4.76 E-6	0.0522	15500
15	4.76 E-6	0.0570	16500
16	4.48 E-6	0.0616	17500
17	6.16 E-6	0.0669	18500
18	4.76 E-6	0.0724	19500

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0076	1000
2	0.0112	3000
3	0.0146	5000
4	0.0174	6000
5	0.0202	7000
6	0.0224	8000
7	0.0252	9000
8	0.0291	10000
9	0.0330	11000
10	0.0361	12000
11	0.0406	13000
12	0.0454	14000
13	0.0498	15000
14	0.0546	16000
15	0.0594	17000
16	0.0638	18000
17	0.0700	19000
18	0.0748	20000



TABLE 228

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 2-L-6, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=7.78$ ,  $R=.128$ ,  $S=3.21$ ,  $U_c = -1$ ,  $t@K_5=0$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.3476	0.0025	5000	1000	2.52 E-6
1.3516	0.0040	15000	10000	3.92 E-7
1.3530	0.0014	25000	10000	1.40 E-7
1.3555	0.0025	35000	10000	2.52 E-7
1.3569	0.0014	40000	5000	2.80 E-7
1.3600	0.0031	44500	4500	6.84 E-7
1.3636	0.0037	48500	4000	9.10 E-7
1.3650	0.0014	50500	2000	7.00 E-7
1.3664	0.0014	52500	2000	7.00 E-7
1.3673	0.0014	54500	2000	7.00 E-7
1.3706	0.0028	56500	2000	1.40 E-6
1.3737	0.0031	58500	2000	1.54 E-6
1.3759	0.0022	60500	2000	1.12 E-6
1.3779	0.0020	62500	2000	9.80 E-7
1.3818	0.0039	64500	2000	1.96 E-6
1.3846	0.0028	66500	2000	1.40 E-6
1.3880	0.0034	68500	2000	1.68 E-6
1.3922	0.0042	70500	2000	2.10 E-6
1.3958	0.0036	72500	2000	1.82 E-6
1.3980	0.0022	74500	2000	1.12 E-6
1.4028	0.0048	76500	2000	2.33 E-6
1.4062	0.0034	78500	2000	1.68 E-6
1.4109	0.0048	80500	2000	2.33 E-6
1.4140	0.0031	82500	2000	1.54 E-6
1.4190	0.0050	84500	2000	2.52 E-6
1.4227	0.0036	86500	2000	1.82 E-6
1.4274	0.0048	88500	2000	2.33 E-6
1.4319	0.0045	90500	2000	2.24 E-6
1.4364	0.0045	92500	2000	2.24 E-6

TABLE 228 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	2.52 E-6	0.0013	500
2	3.92 E-7	0.0045	6000
3	1.40 E-7	0.0072	16000
4	2.52 E-7	0.0092	26000
5	2.80 E-7	0.0111	33500
6	6.84 E-7	0.0134	38250
7	9.10 E-7	0.0163	42500
8	7.00 E-7	0.0193	45500
9	7.00 E-7	0.0207	47500
10	7.00 E-7	0.0221	49500
11	1.40 E-6	0.0242	51500
12	1.54 E-6	0.0272	53500
13	1.12 E-6	0.0298	55500
14	9.80 E-7	0.0319	57500
15	1.96 E-6	0.0349	59500
16	1.40 E-6	0.0382	61500
17	1.68 E-6	0.0413	63500
18	2.10 E-6	0.0451	65500
19	1.82 E-6	0.0490	67500
20	1.12 E-6	0.0519	69500
21	2.38 E-6	0.0554	71500
22	1.68 E-6	0.0595	73500
23	2.38 E-6	0.0636	75500
24	1.54 E-6	0.0675	77500
25	2.52 E-6	0.0715	79500
26	1.82 E-6	0.0759	81500
27	2.38 E-6	0.0801	83500
28	2.24 E-6	0.0847	85500
29	2.24 E-6	0.0892	87500

TABLE 228 (continued)

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0025	1000
2	0.0065	11000
3	0.0079	21000
4	0.0104	31000
5	0.0118	36000
6	0.0149	40500
7	0.0186	44500
8	0.0200	46500
9	0.0214	48500
10	0.0228	50500
11	0.0256	52500
12	0.0287	54500
13	0.0309	56500
14	0.0329	58500
15	0.0368	60500
16	0.0396	62500
17	0.0430	64500
18	0.0472	66500
19	0.0508	68500
20	0.0531	70500
21	0.0578	72500
22	0.0612	74500
23	0.0659	76500
24	0.0690	78500
25	0.0741	80500
26	0.0777	82500
27	0.0825	84500
28	0.0869	86500
29	0.0914	88500

TABLE 229

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 2-L-6, TENSION-COMPRESSION  
 F=12Hz,  $K_2=7.78$ ,  $R=.128$ ,  $S=3.21$ ,  $U_c=-1$ ,  $t@K_5=15$  Min.

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.0903	0.0039	1000	1000	3.92 E-6
1.0934	0.0031	6000	5000	6.16 E-7
1.0948	0.0014	11000	5000	2.80 E-7
1.0965	0.0017	16000	5000	3.36 E-7
1.0976	0.0011	18000	2000	5.60 E-7
1.0984	0.0008	20000	2000	4.20 E-7
1.0993	0.0008	22000	2000	4.20 E-7
1.1007	0.0014	24000	2000	7.00 E-7
1.1026	0.0020	26000	2000	9.80 E-7
1.1046	0.0020	28000	2000	9.80 E-7
1.1068	0.0022	30000	2000	1.12 E-6
1.1091	0.0022	32000	2000	1.12 E-6
1.1116	0.0025	34000	2000	1.26 E-6
1.1147	0.0031	36000	2000	1.54 E-6
1.1172	0.0025	38000	2000	1.26 E-6
1.1200	0.0028	40000	2000	1.40 E-6
1.1239	0.0039	42000	2000	1.96 E-6
1.1267	0.0028	44000	2000	1.40 E-6
1.1306	0.0039	46000	2000	1.96 E-6
1.1351	0.0045	48000	2000	2.24 E-6
1.1388	0.0036	50000	2000	1.82 E-6
1.1424	0.0036	52000	2000	1.82 E-6
1.1463	0.0039	54000	2000	1.96 E-6
1.1514	0.0050	56000	2000	2.52 E-6
1.1547	0.0034	58000	2000	1.68 E-6
1.1598	0.0050	60000	2000	2.52 E-6
1.1648	0.0050	62000	2000	2.52 E-6
1.1687	0.0039	64000	2000	1.96 E-6
1.1732	0.0045	66000	2000	2.24 E-6

TABLE 229 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	3.92 E-6	0.0020	500
2	6.16 E-7	0.0055	3500
3	2.80 E-7	0.0077	8500
4	3.36 E-7	0.0092	13500
5	5.60 E-7	0.0106	17000
6	4.20 E-7	0.0116	19000
7	4.20 E-7	0.0125	21000
8	7.00 E-7	0.0136	23000
9	9.80 E-7	0.0153	25000
10	9.80 E-7	0.0172	27000
11	1.12 E-6	0.0193	29000
12	1.12 E-6	0.0216	31000
13	1.26 E-6	0.0239	33000
14	1.54 E-6	0.0267	35000
15	1.26 E-6	0.0295	37000
16	1.40 E-6	0.0322	39000
17	1.96 E-6	0.0356	41000
18	1.40 E-6	0.0389	43000
19	1.96 E-6	0.0423	45000
20	2.24 E-6	0.0465	47000
21	1.82 E-6	0.0505	49000
22	1.82 E-6	0.0542	51000
23	1.96 E-6	0.0580	53000
24	2.52 E-6	0.0624	55000
25	1.68 E-6	0.0666	57000
26	2.52 E-6	0.0708	59000
27	2.52 E-6	0.0759	61000
28	1.96 E-6	0.0804	63000
29	2.24 E-6	0.0846	65000

TABLE 229 (continued)

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0039	1000
2	0.0070	6000
3	0.0084	11000
4	0.0101	16000
5	0.0112	18000
6	0.0120	20000
7	0.0129	22000
8	0.0143	24000
9	0.0162	26000
10	0.0182	28000
11	0.0204	30000
12	0.0227	32000
13	0.0252	34000
14	0.0283	36000
15	0.0308	38000
16	0.0336	40000
17	0.0375	42000
18	0.0403	44000
19	0.0442	46000
20	0.0487	48000
21	0.0524	50000
22	0.0560	52000
23	0.0599	54000
24	0.0650	56000
25	0.0683	58000
26	0.0734	60000
27	0.0784	62000
28	0.0823	64000
29	0.0868	66000

TABLE 230

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 2-L-6, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=7.78$ ,  $R=.128$ ,  $S=3.21$ ,  $U_c = -1$ ,  $t@K_5=60\text{ Min.}$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.9223	0.0028	1000	1000	2.80 E-6
0.9260	0.0036	6000	5000	7.28 E-7
0.9288	0.0028	11000	5000	5.60 E-7
0.9316	0.0028	16000	5000	5.60 E-7
0.9352	0.0036	21000	5000	7.28 E-7
0.9377	0.0025	23000	2000	1.26 E-6
0.9394	0.0017	25000	2000	8.40 E-7
0.9411	0.0017	27000	2000	8.40 E-7
0.9433	0.0022	29000	2000	1.12 E-6
0.9464	0.0031	31000	2000	1.54 E-6
0.9489	0.0025	33000	2000	1.26 E-6
0.9526	0.0036	35000	2000	1.82 E-6
0.9559	0.0034	37000	2000	1.68 E-6
0.9596	0.0036	39000	2000	1.82 E-6
0.9638	0.0042	41000	2000	2.10 E-6
0.9674	0.0036	43000	2000	1.82 E-6
0.9705	0.0031	45000	2000	1.54 E-6
0.9750	0.0045	47000	2000	2.24 E-6
0.9780	0.0031	49000	2000	1.54 E-6
0.9825	0.0045	51000	2000	2.24 E-6
0.9862	0.0036	53000	2000	1.82 E-6
0.9901	0.0039	55000	2000	1.96 E-6
0.9937	0.0036	57000	2000	1.82 E-6
0.9982	0.0045	59000	2000	2.24 E-6
1.0038	0.0056	61000	2000	2.80 E-6
1.0074	0.0036	63000	2000	1.82 E-6
1.0122	0.0048	65000	2000	2.38 E-6
1.0164	0.0042	67000	2000	2.10 E-6
1.0209	0.0045	69000	2000	2.24 E-6

TABLE 230 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	2.80 E-6	0.0014	500
2	7.28 E-7	0.0046	3500
3	5.60 E-7	0.0078	8500
4	5.60 E-7	0.0106	13500
5	7.28 E-7	0.0139	18500
6	1.26 E-6	0.0169	22000
7	8.40 E-7	0.0190	24000
8	8.40 E-7	0.0207	26000
9	1.12 E-6	0.0227	28000
10	1.54 E-6	0.0253	30000
11	1.26 E-6	0.0281	32000
12	1.82 E-6	0.0312	34000
13	1.68 E-6	0.0347	36000
14	1.82 E-6	0.0382	38000
15	2.10 E-6	0.0421	40000
16	1.82 E-6	0.0461	42000
17	1.54 E-6	0.0494	44000
18	2.24 E-6	0.0532	46000
19	1.54 E-6	0.0570	48000
20	2.24 E-6	0.0608	50000
21	1.82 E-6	0.0648	52000
22	1.96 E-6	0.0686	54000
23	1.82 E-6	0.0724	56000
24	2.24 E-6	0.0764	58000
25	2.80 E-6	0.0815	60000
26	1.82 E-6	0.0861	62000
27	2.38 E-6	0.0903	64000
28	2.10 E-6	0.0948	66000
29	2.24 E-6	0.0991	68000



TABLE 230 (continued)

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0028	1000
2	0.0064	6000
3	0.0092	11000
4	0.0120	16000
5	0.0157	21000
6	0.0182	23000
7	0.0199	25000
8	0.0216	27000
9	0.0238	29000
10	0.0269	31000
11	0.0294	33000
12	0.0330	35000
13	0.0364	37000
14	0.0400	39000
15	0.0442	41000
16	0.0479	43000
17	0.0510	45000
18	0.0554	47000
19	0.0585	49000
20	0.0630	51000
21	0.0666	53000
22	0.0706	55000
23	0.0742	57000
24	0.0787	59000
25	0.0843	61000
26	0.0879	63000
27	0.0927	65000
28	0.0969	67000
29	0.1014	69000

TABLE 231

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 2-L-6, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=7.78$ ,  $R=.128$ ,  $S=3.21$ ,  $U_c = -1$ ,  $t@K_5=24\text{ Hr.}$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
1.1922	0.0056	8000	2000	2.80 E-6
1.1939	0.0017	13000	5000	3.36 E-7
1.1956	0.0017	18000	5000	3.36 E-7
1.1992	0.0036	23000	5000	7.28 E-7
1.1998	0.0006	25000	2000	2.80 E-7
1.2015	0.0017	27000	2000	8.40 E-7
1.2029	0.0014	29000	2000	7.00 E-7
1.2040	0.0011	31000	2000	5.60 E-7
1.2057	0.0017	33000	2000	8.40 E-7
1.2076	0.0020	35000	2000	9.80 E-7
1.2096	0.0020	37000	2000	9.80 E-7
1.2121	0.0025	39000	2000	1.26 E-6
1.2141	0.0020	41000	2000	9.80 E-7
1.2174	0.0034	43000	2000	1.68 E-6
1.2205	0.0031	45000	2000	1.54 E-6
1.2236	0.0031	47000	2000	1.54 E-6
1.2267	0.0031	49000	2000	1.54 E-6
1.2289	0.0022	51000	2000	1.12 E-6
1.2314	0.0025	53000	2000	1.26 E-6
1.2354	0.0039	55000	2000	1.96 E-6
1.2387	0.0034	57000	2000	1.68 E-6
1.2412	0.0025	59000	2000	1.26 E-6
1.2454	0.0042	61000	2000	2.10 E-6
1.2499	0.0045	63000	2000	2.24 E-6
1.2547	0.0048	65000	2000	2.38 E-6
1.2589	0.0042	67000	2000	2.10 E-6
1.2634	0.0045	69000	2000	2.24 E-6
1.2678	0.0045	71000	2000	2.24 E-6
1.2723	0.0045	73000	2000	2.24 E-6

TABLE 231 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	2.80 E-6	0.0028	1000
2	3.36 E-7	0.0064	4500
3	3.36 E-7	0.0081	9500
4	7.28 E-7	0.0108	14500
5	2.80 E-7	0.0129	18000
6	8.40 E-7	0.0140	20000
7	7.00 E-7	0.0155	22000
8	5.60 E-7	0.0168	24000
9	8.40 E-7	0.0182	26000
10	9.80 E-7	0.0200	28000
11	9.80 E-7	0.0220	30000
12	1.26 E-6	0.0242	32000
13	9.80 E-7	0.0265	34000
14	1.68 E-6	0.0291	36000
15	1.54 E-6	0.0323	38000
16	1.54 E-6	0.0354	40000
17	1.54 E-6	0.0385	42000
18	1.12 E-6	0.0412	44000
19	1.26 E-6	0.0435	46000
20	1.96 E-6	0.0468	48000
21	1.68 E-6	0.0504	50000
22	1.26 E-6	0.0533	52000
23	2.10 E-6	0.0567	54000
24	2.24 E-6	0.0610	56000
25	2.38 E-6	0.0657	58000
26	2.10 E-6	0.0701	60000
27	2.24 E-6	0.0745	62000
28	2.24 E-6	0.0790	64000
29	2.24 E-6	0.0834	66000

TABLE 231 (continued)

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0056	2000
2	0.0073	7000
3	0.0090	12000
4	0.0126	17000
5	0.0132	19000
6	0.0148	21000
7	0.0162	23000
8	0.0174	25000
9	0.0190	27000
10	0.0210	29000
11	0.0230	31000
12	0.0255	33000
13	0.0274	35000
14	0.0308	37000
15	0.0339	39000
16	0.0370	41000
17	0.0400	43000
18	0.0423	45000
19	0.0448	47000
20	0.0487	49000
21	0.0521	51000
22	0.0546	53000
23	0.0588	55000
24	0.0633	57000
25	0.0680	59000
26	0.0722	61000
27	0.0767	63000
28	0.0812	65000
29	0.0857	67000

TABLE 232

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 4-L-1, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.5$ ,  $S=2.5$ ,  $U_c=-1$ ,  $t@K_5=15\text{ Min.}$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.9884	0.0008	27000	1000	8.40 E-7
0.9895	0.0011	29000	2000	5.60 E-7
0.9904	0.0008	31000	2000	4.20 E-7
0.9915	0.0011	33000	2000	5.60 E-7
0.9929	0.0014	35000	2000	7.00 E-7
0.9943	0.0014	37000	2000	7.00 E-7
0.9951	0.0008	39000	2000	4.20 E-7
0.9960	0.0008	41000	2000	4.20 E-7
0.9979	0.0020	43000	2000	9.80 E-7
0.9993	0.0014	45000	2000	7.00 E-7
1.0002	0.0008	47000	2000	4.20 E-7
1.0021	0.0020	49000	2000	9.80 E-7
1.0044	0.0022	51000	2000	1.12 E-6
1.0066	0.0022	53000	2000	1.12 E-6
1.0080	0.0014	55000	2000	7.00 E-7
1.0091	0.0011	57000	2000	5.60 E-7
1.0116	0.0025	59000	2000	1.26 E-6
1.0136	0.0020	61000	2000	9.80 E-7
1.0161	0.0025	63000	2000	1.26 E-6
1.0178	0.0017	65000	2000	8.40 E-7
1.0195	0.0017	67000	2000	8.40 E-7
1.0214	0.0020	69000	2000	9.80 E-7
1.0240	0.0025	71000	2000	1.26 E-6
1.0259	0.0020	73000	2000	9.80 E-7
1.0282	0.0022	75000	2000	1.12 E-6
1.0304	0.0022	77000	2000	1.12 E-6
1.0332	0.0028	79000	2000	1.40 E-6
1.0354	0.0022	81000	2000	1.12 E-6

Data for  $t@K_5=0$  are in Table 135, page 80.

TABLE 232 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	8.40 E-7	0.0004	500
2	5.60 E-7	0.0014	2000
3	4.20 E-7	0.0024	4000
4	5.60 E-7	0.0034	6000
5	7.00 E-7	0.0046	8000
6	7.00 E-7	0.0060	10000
7	4.20 E-7	0.0071	12000
8	4.20 E-7	0.0080	14000
9	9.80 E-7	0.0094	16000
10	7.00 E-7	0.0111	18000
11	4.20 E-7	0.0122	20000
12	9.80 E-7	0.0136	22000
13	1.12 E-6	0.0157	24000
14	1.12 E-6	0.0179	26000
15	7.00 E-7	0.0197	28000
16	5.60 E-7	0.0210	30000
17	1.26 E-6	0.0228	32000
18	9.80 E-7	0.0251	34000
19	1.26 E-6	0.0273	36000
20	3.40 E-7	0.0294	38000
21	8.40 E-7	0.0311	40000
22	9.80 E-7	0.0329	42000
23	1.26 E-6	0.0351	44000
24	9.80 E-7	0.0374	46000
25	1.12 E-6	0.0395	48000
26	1.12 E-6	0.0417	50000
27	1.40 E-6	0.0442	52000
28	1.12 E-6	0.0468	54000

TABLE 232 (continued)

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0008	1000
2	0.0020	3000
3	0.0028	5000
4	0.0039	7000
5	0.0053	9000
6	0.0067	11000
7	0.0076	13000
8	0.0084	15000
9	0.0104	17000
10	0.0118	19000
11	0.0126	21000
12	0.0146	23000
13	0.0168	25000
14	0.0190	27000
15	0.0204	29000
16	0.0216	31000
17	0.0241	33000
18	0.0260	35000
19	0.0286	37000
20	0.0302	39000
21	0.0319	41000
22	0.0339	43000
23	0.0364	45000
24	0.0384	47000
25	0.0406	49000
26	0.0428	51000
27	0.0456	53000
28	0.0479	55000

TABLE 233

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 4-L-1, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.5$ ,  $S=2.5$ ,  $U_c=-1$ ,  $t@K_5=60$  Min.

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.9106	0.0008	5000	1000	8.40 E-7
0.9108	0.0003	7000	2000	1.40 E-7
0.9128	0.0020	9000	2000	9.80 E-7
0.9139	0.0011	11000	2000	5.60 E-7
0.9153	0.0014	13000	2000	7.00 E-7
0.9164	0.0011	15000	2000	5.60 E-7
0.9181	0.0017	17000	2000	8.40 E-7
0.9204	0.0022	19000	2000	1.12 E-6
0.9215	0.0011	21000	2000	5.60 E-7
0.9232	0.0017	23000	2000	8.40 E-7
0.9243	0.0011	25000	2000	5.60 E-7
0.9251	0.0008	27000	2000	4.20 E-7
0.9271	0.0020	29000	2000	9.80 E-7
0.9299	0.0028	31000	2000	1.40 E-6
0.9316	0.0017	33000	2000	8.40 E-7
0.9335	0.0020	35000	2000	9.80 E-7
0.9358	0.0022	37000	2000	1.12 E-6
0.9374	0.0017	39000	2000	8.40 E-7
0.9400	0.0025	41000	2000	1.26 E-6
0.9422	0.0022	43000	2000	1.12 E-6
0.9444	0.0022	45000	2000	1.12 E-6
0.9464	0.0020	47000	2000	9.80 E-7
0.9484	0.0020	49000	2000	9.80 E-7
0.9509	0.0025	51000	2000	1.26 E-6
0.9531	0.0022	53000	2000	1.12 E-6
0.9559	0.0028	55000	2000	1.40 E-6
0.9582	0.0022	57000	2000	1.12 E-6



TABLE 233 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	8.40 E-7	0.0004	500
2	1.40 E-7	0.0010	2000
3	9.80 E-7	0.0021	4000
4	5.60 E-7	0.0036	6000
5	7.00 E-7	0.0049	8000
6	5.60 E-7	0.0062	10000
7	8.40 E-7	0.0076	12000
8	1.12 E-6	0.0095	14000
9	5.60 E-7	0.0112	16000
10	8.40 E-7	0.0126	18000
11	5.60 E-7	0.0140	20000
12	4.20 E-7	0.0150	22000
13	9.80 E-7	0.0164	24000
14	1.40 E-6	0.0188	26000
15	8.40 E-7	0.0210	28000
16	9.80 E-7	0.0228	30000
17	1.12 E-6	0.0249	32000
18	8.40 E-7	0.0269	34000
19	1.26 E-6	0.0290	36000
20	1.12 E-6	0.0314	38000
21	1.12 E-6	0.0336	40000
22	9.80 E-7	0.0357	42000
23	9.80 E-7	0.0377	44000
24	1.26 E-6	0.0399	46000
25	1.12 E-6	0.0423	48000
26	1.40 E-6	0.0448	50000
27	1.12 E-6	0.0473	52000

TABLE 233 (continued)

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0008	1000
2	0.0011	3000
3	0.0031	5000
4	0.0042	7000
5	0.0056	9000
6	0.0067	11000
7	0.0084	13000
8	0.0106	15000
9	0.0118	17000
10	0.0134	19000
11	0.0146	21000
12	0.0154	23000
13	0.0174	25000
14	0.0202	27000
15	0.0218	29000
16	0.0238	31000
17	0.0260	33000
18	0.0277	35000
19	0.0302	37000
20	0.0325	39000
21	0.0347	41000
22	0.0367	43000
23	0.0386	45000
24	0.0412	47000
25	0.0434	49000
26	0.0462	51000
27	0.0484	53000

TABLE 234

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 4-L-1, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.5$ ,  $S=2.5$ ,  $U_c = -1$ ,  $t@K_5=24\text{ Hr.}$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.7700	0.0020	9000	1000	1.96 E-6
0.7720	0.0020	11000	2000	9.80 E-7
0.7736	0.0017	13000	2000	8.40 E-7
0.7756	0.0020	15000	2000	9.80 E-7
0.7778	0.0022	17000	2000	1.12 E-6
0.7804	0.0025	19000	2000	1.26 E-6
0.7826	0.0022	21000	2000	1.12 E-6
0.7843	0.0017	23000	2000	8.40 E-7
0.7871	0.0028	25000	2000	1.40 E-6
0.7896	0.0025	27000	2000	1.26 E-6
0.7907	0.0011	29000	2000	5.60 E-7
0.7921	0.0014	31000	2000	7.00 E-7
0.7958	0.0036	33000	2000	1.82 E-6
0.7986	0.0028	35000	2000	1.40 E-6
0.8005	0.0020	37000	2000	9.80 E-7
0.8030	0.0025	39000	2000	1.26 E-6
0.8056	0.0025	41000	2000	1.26 E-6
0.8084	0.0028	43000	2000	1.40 E-6
0.8109	0.0025	45000	2000	1.26 E-6

TABLE 234 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	1.96 E-6	0.0010	500
2	9.80 E-7	0.0029	2000
3	8.40 E-7	0.0048	4000
4	9.80 E-7	0.0066	6000
5	1.12 E-6	0.0087	8000
6	1.26 E-6	0.0111	10000
7	1.12 E-6	0.0134	12000
8	8.40 E-7	0.0154	14000
9	1.40 E-6	0.0176	16000
10	1.26 E-6	0.0203	18000
11	5.60 E-7	0.0221	20000
12	7.00 E-7	0.0234	22000
13	1.82 E-6	0.0259	24000
14	1.40 E-6	0.0291	26000
15	9.80 E-7	0.0315	28000
16	1.26 E-6	0.0337	30000
17	1.26 E-6	0.0363	32000
18	1.40 E-6	0.0389	34000
19	1.26 E-6	0.0416	36000

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0020	1000
2	0.0039	3000
3	0.0056	5000
4	0.0076	7000
5	0.0098	9000
6	0.0123	11000
7	0.0146	13000
8	0.0162	15000
9	0.0190	17000
10	0.0216	19000
11	0.0227	21000
12	0.0241	23000
13	0.0277	25000
14	0.0305	27000
15	0.0325	29000
16	0.0350	31000
17	0.0375	33000
18	0.0403	35000
19	0.0428	37000

TABLE 235

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 1-L-9, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.1$ ,  $S=2.5$ ,  $U_c = -2$ ,  $t@K_5=15$  Min.

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.8669	0.0045	12000	1000	4.48 E-6
0.8719	0.0050	16000	4000	1.26 E-6
0.8736	0.0017	18000	2000	8.40 E-7
0.8750	0.0014	20000	2000	7.00 E-7
0.8781	0.0031	22000	2000	1.54 E-6
0.8798	0.0017	23000	1000	1.68 E-6
0.8814	0.0017	24000	1000	1.68 E-6
0.8828	0.0014	25000	1000	1.40 E-6
0.8851	0.0022	26000	1000	2.24 E-6
0.8868	0.0017	27000	1000	1.68 E-6
0.8893	0.0025	28000	1000	2.52 E-6
0.8926	0.0034	29000	1000	3.36 E-6
0.8954	0.0028	30000	1000	2.80 E-6
0.8996	0.0042	31000	1000	4.20 E-6
0.9016	0.0020	32000	1000	1.96 E-6
0.9050	0.0034	33000	1000	3.36 E-6
0.9078	0.0028	34000	1000	2.80 E-6
0.9108	0.0031	35000	1000	3.08 E-6
0.9148	0.0039	36000	1000	3.92 E-6
0.9187	0.0039	37000	1000	3.92 E-6
0.9223	0.0036	38000	1000	3.64 E-6
0.9262	0.0039	39000	1000	3.92 E-6
0.9299	0.0036	40000	1000	3.64 E-6
0.9341	0.0042	41000	1000	4.20 E-6
0.9380	0.0041	42000	1000	4.14 E-6
0.9433	0.0053	43000	1000	5.32 E-6
0.9475	0.0042	44000	1000	4.20 E-6
0.9520	0.0045	45000	1000	4.48 E-6
0.9559	0.0039	46000	1000	3.92 E-6

Data for  $t@K_5=0$  are in Table 132, page 73.

TABLE 235

(continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	4.48 E-6	0.0022	500
2	1.26 E-6	0.0070	3000
3	8.40 E-7	0.0104	6000
4	7.00 E-7	0.0119	8000
5	1.54 E-6	0.0141	10000
6	1.68 E-6	0.0165	11500
7	1.68 E-6	0.0182	12500
8	1.40 E-6	0.0197	13500
9	2.24 E-6	0.0216	14500
10	1.68 E-6	0.0235	15500
11	2.52 E-6	0.0256	16500
12	3.36 E-6	0.0286	17500
13	2.80 E-6	0.0316	18500
14	4.20 E-6	0.0351	19500
15	1.96 E-6	0.0382	20500
16	3.36 E-6	0.0409	21500
17	2.80 E-6	0.0440	22500
18	3.08 E-6	0.0469	23500
19	3.92 E-6	0.0504	24500
20	3.92 E-6	0.0543	25500
21	3.64 E-6	0.0581	26500
22	3.92 E-6	0.0619	27500
23	3.64 E-6	0.0657	28500
24	4.20 E-6	0.0696	29500
25	4.14 E-6	0.0738	30500
26	5.32 E-6	0.0785	31500
27	4.20 E-6	0.0832	32500
28	4.48 E-6	0.0876	33500
29	3.92 E-6	0.0918	34500

TABLE 235

(continued)

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0045	1000
2	0.0095	5000
3	0.0112	7000
4	0.0126	9000
5	0.0157	11000
6	0.0174	12000
7	0.0190	13000
8	0.0204	14000
9	0.0227	15000
10	0.0244	16000
11	0.0269	17000
12	0.0302	18000
13	0.0330	19000
14	0.0372	20000
15	0.0392	21000
16	0.0426	22000
17	0.0454	23000
18	0.0484	24000
19	0.0524	25000
20	0.0563	26000
21	0.0599	27000
22	0.0638	28000
23	0.0675	29000
24	0.0717	30000
25	0.0758	31000
26	0.0811	32000
27	0.0853	33000
28	0.0898	34000
29	0.0937	35000

TABLE 236

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 1-L-9, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.1$ ,  $S=2.5$ ,  $U_c=-2$ ,  $t@K_5=60\text{ Min.}$

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.6188	0.0056	3000	1000	5.60 E-6
0.6250	0.0062	7000	4000	1.54 E-6
0.6272	0.0022	9000	2000	1.12 E-6
0.6308	0.0036	11000	2000	1.82 E-6
0.6336	0.0028	13000	2000	1.40 E-6
0.6356	0.0020	14000	1000	1.96 E-6
0.6381	0.0025	15000	1000	2.52 E-6
0.6409	0.0028	16000	1000	2.80 E-6
0.6440	0.0031	17000	1000	3.08 E-6
0.6471	0.0031	18000	1000	3.08 E-6
0.6496	0.0025	19000	1000	2.52 E-6
0.6532	0.0036	20000	1000	3.64 E-6
0.6572	0.0039	21000	1000	3.92 E-6
0.6605	0.0034	22000	1000	3.36 E-6
0.6636	0.0031	23000	1000	3.08 E-6
0.6684	0.0048	24000	1000	4.76 E-6
0.6712	0.0028	25000	1000	2.80 E-6
0.6762	0.0050	26000	1000	5.04 E-6
0.6810	0.0048	27000	1000	4.76 E-6
0.6852	0.0042	28000	1000	4.20 E-6
0.6899	0.0048	29000	1000	4.76 E-6
0.6941	0.0042	30000	1000	4.20 E-6
0.6989	0.0048	31000	1000	4.76 E-6
0.7036	0.0048	32000	1000	4.76 E-6
0.7087	0.0050	33000	1000	5.04 E-6
0.7132	0.0045	34000	1000	4.48 E-6



TABLE 236 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	5.60 E-6	0.0028	500
2	1.54 E-6	0.0087	3000
3	1.12 E-6	0.0129	6000
4	1.82 E-6	0.0158	8000
5	1.40 E-6	0.0190	10000
6	1.96 E-6	0.0214	11500
7	2.52 E-6	0.0237	12500
8	2.80 E-6	0.0263	13500
9	3.08 E-6	0.0293	14500
10	3.08 E-6	0.0323	15500
11	2.52 E-6	0.0351	16500
12	3.64 E-6	0.0382	17500
13	3.92 E-6	0.0420	18500
14	3.36 E-6	0.0456	19500
15	3.08 E-6	0.0489	20500
16	4.76 E-6	0.0528	21500
17	2.80 E-6	0.0566	22500
18	5.04 E-6	0.0605	23500
19	4.76 E-6	0.0654	24500
20	4.20 E-6	0.0699	25500
21	4.76 E-6	0.0743	26500
22	4.20 E-6	0.0788	27500
23	4.76 E-6	0.0833	28500
24	4.76 E-6	0.0881	29500
25	5.04 E-6	0.0930	30500
26	4.48 E-6	0.0977	31500

TABLE 236 (continued)

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0056	1000
2	0.0118	5000
3	0.0140	7000
4	0.0176	9000
5	0.0204	11000
6	0.0224	12000
7	0.0249	13000
8	0.0277	14000
9	0.0308	15000
10	0.0339	16000
11	0.0364	17000
12	0.0400	18000
13	0.0440	19000
14	0.0473	20000
15	0.0504	21000
16	0.0552	22000
17	0.0580	23000
18	0.0630	24000
19	0.0673	25000
20	0.0720	26000
21	0.0767	27000
22	0.0809	28000
23	0.0857	29000
24	0.0904	30000
25	0.0955	31000
26	0.1000	32000

TABLE 237

EFFECTS OF UNDERLOADS ON CRACK GROWTH OF  
 2219-T851 ALUMINUM ALLOY PLATE IN ROOM  
 TEMPERATURE DESICCATED AIR  
 SPECIMEN NO. 1-L-9, TENSION-COMPRESSION  
 $F=12\text{Hz}$ ,  $K_2=10$ ,  $R=0.1$ ,  $S=2.5$ ,  $U_c = -2$ ,  $t@K_5=24$  Hr.

A	DELTA A	CYCLES	DELTA CYCLES	DA/DN
RUN NO. 1				
0.4936	0.0053	2000	1000	5.32 E-6
0.5001	0.0064	6000	4000	1.61 E-6
0.5040	0.0039	8000	2000	1.96 E-6
0.5090	0.0050	10000	2000	2.52 E-6
0.5113	0.0022	11000	1000	2.24 E-6
0.5144	0.0031	12000	1000	3.08 E-6
0.5169	0.0025	13000	1000	2.52 E-6
0.5208	0.0039	14000	1000	3.92 E-6
0.5244	0.0036	15000	1000	3.64 E-6
0.5281	0.0036	16000	1000	3.64 E-6
0.5314	0.0034	17000	1000	3.36 E-6
0.5354	0.0039	18000	1000	3.92 E-6
0.5393	0.0039	19000	1000	3.92 E-6
0.5426	0.0034	20000	1000	3.36 E-6
0.5463	0.0036	21000	1000	3.64 E-6
0.5505	0.0042	22000	1000	4.20 E-6
0.5544	0.0039	23000	1000	3.92 E-6
0.5600	0.0056	24000	1000	5.60 E-6
0.5645	0.0045	25000	1000	4.48 E-6
0.5678	0.0034	26000	1000	3.36 E-6
0.5743	0.0064	27000	1000	6.44 E-6
0.5782	0.0039	28000	1000	3.92 E-6
0.5835	0.0053	29000	1000	5.32 E-6
0.5880	0.0045	30000	1000	4.48 E-6
0.5928	0.0048	31000	1000	4.76 E-6
0.5970	0.0042	32000	1000	4.20 E-6
0.6031	0.0062	33000	1000	6.16 E-6

TABLE 237 (continued)

## VALUES AT MIDPOINT OF READING INCREMENT

INCR #	DA/DN	TOT CRACK	TOT CYCLES
1	5.32 E-6	0.0027	500
2	1.61 E-6	0.0085	3000
3	1.96 E-6	0.0137	6000
4	2.52 E-6	0.0182	8000
5	2.24 E-6	0.0218	9500
6	3.08 E-6	0.0245	10500
7	2.52 E-6	0.0273	11500
8	3.92 E-6	0.0305	12500
9	3.64 E-6	0.0343	13500
10	3.64 E-6	0.0379	14500
11	3.36 E-6	0.0414	15500
12	3.92 E-6	0.0451	16500
13	3.92 E-6	0.0490	17500
14	3.36 E-6	0.0526	18500
15	3.64 E-6	0.0561	19500
16	4.20 E-6	0.0601	20500
17	3.92 E-6	0.0641	21500
18	5.60 E-6	0.0689	22500
19	4.48 E-6	0.0739	23500
20	3.36 E-6	0.0778	24500
21	6.44 E-6	0.0827	25500
22	3.92 E-6	0.0879	26500
23	5.32 E-6	0.0925	27500
24	4.48 E-6	0.0974	28500
25	4.76 E-6	0.1021	29500
26	4.20 E-6	0.1065	30500
27	6.16 E-6	0.1117	31500

TABLE 237 (continued)

## VALUES AT END OF READING INCREMENT

INCR #	TOT CRACK	TOT CYCLES
1	0.0053	1000
2	0.0118	5000
3	0.0157	7000
4	0.0207	9000
5	0.0230	10000
6	0.0260	11000
7	0.0286	12000
8	0.0325	13000
9	0.0361	14000
10	0.0398	15000
11	0.0431	16000
12	0.0470	17000
13	0.0510	18000
14	0.0543	19000
15	0.0580	20000
16	0.0622	21000
17	0.0661	22000
18	0.0717	23000
19	0.0762	24000
20	0.0795	25000
21	0.0860	26000
22	0.0899	27000
23	0.0952	28000
24	0.0997	29000
25	0.1044	30000
26	0.1086	31000
27	0.1148	32000

576